RW Series

Commercial Reversible Chiller - 60 Hz

- **8-50 Tons**

RW Series Installation Manual

Installation Information

Water Piping Connections

Electrical Data

Microprocessor Control

Startup Procedures

Preventive Maintenance

Johnson Controls

146.00-NOM6 02/10

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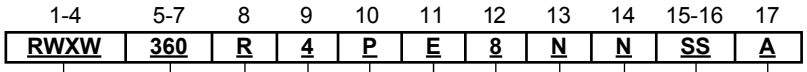
Model Nomenclature



Model
RWXW = RW Series Water-to-Water

Capacity
MBTUH *see model size table*

Operation
R = Reversible

Voltage
3 = 208-230/60/3*
4 = 460/60/3
5 = 575/60/3
8 = 380/60/3

Phase protection
P = Phase Guard

Chassis
E = Enclosed
F = Open Frame

*208-230/60/3 is not available on RWXW540.

Model Size	Nominal Tons
096	8
108	9
120	10
140	12
180	15
210	18
240	20
360	30
540	50

Vintage
A = Current 096-240
B = 360 & 540

Non-Standard Options
SS = Standard Options

Future Use
N = Future Use

Future Use
N = Future Use

Controls
8 = FX10 without communication, with User Interface
9 = FX10 with/Open N2 Com Card, with User Interface
0 = FX10 with/Lonworks Com Card, with User Interface
3 = FX10 with/BacNet Com Card, with User Interface

02/11/10

General Installation Information

Safety Considerations

Installing and servicing air conditioning and heating equipment can be hazardous due to system pressure and electrical components. Only trained and qualified service personnel should install, repair or service heating and air conditioning equipment. When working on heating and air conditioning equipment, observe precautions in the literature, tags and labels attached to the unit and other safety precautions that may apply.

Follow all safety codes. Wear safety glasses and work gloves. Use quenching cloth for brazing operations. Have fire extinguisher available for all brazing operations.

NOTE: Before installing, check voltage of unit(s) to ensure proper voltage.

WARNING: Before performing service or maintenance operations on the system, turn off main power switches to the unit. Electrical shock could cause serious personal injury.

Application

Units are not intended for heating domestic (potable water) by direct coupling. If used for this type of application, a secondary heat exchanger must be used.

Moving and Storage

Move units in the normal “Up” orientation as indicated by the labels on the unit packaging. When the equipment is received, all items should be carefully checked against the bill of lading to ensure that all crates and cartons have been received in good condition. Examine units for shipping damage, removing unit packaging if necessary to properly inspect unit. Units in question should also be internally inspected. If any damage is observed, the carrier should make the proper notation on delivery receipt acknowledging the damage. Units are to be stored in a location that provides adequate protection from dirt, debris and moisture.

WARNING: To avoid equipment damage, do not leave the system filled in a building without heat during cold weather, unless adequate freeze protection levels of antifreeze are used. Heat exchangers do not fully drain and will freeze unless protected, causing permanent damage.

Unit Location

Provide sufficient room to make water and electrical connections. If the unit is located in a confined space, provisions must be made for unit servicing. Locate the unit in an indoor area that allows easy removal of the access panels and has enough space for service personnel to perform maintenance or repair. These units are not approved for outdoor installation and, therefore, must be installed inside the structure being conditioned. Do not locate units in areas subject to freezing conditions.

WARNING: Do not store or install units in corrosive environments or in locations subject to temperature or humidity extremes (e.g. attics, garages, rooftops, etc.). Corrosive conditions and high temperature or humidity can significantly reduce performance, reliability, and service life.

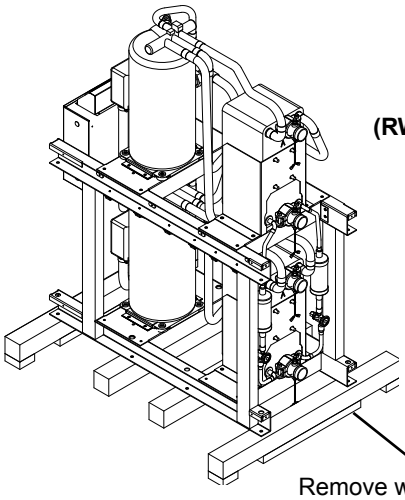
WARNING: To avoid equipment damage and possible voiding of warranty, be sure that properly sized strainers are installed upstream of both brazed plate heat exchangers to protect them against particles in the fluid.

General Installation Information cont.

Mounting Units

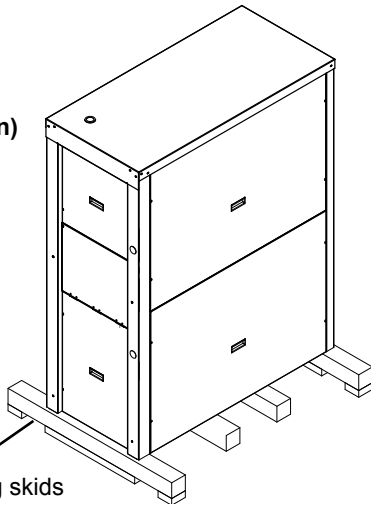
Remove the unit from the wooden shipping skids (see Figures 1 and 2). Units will be shipped with heavy duty rubber grommets to reduce sound that can be transmitted through the floor via the frame (see grommets below). For additional sound attenuation, use heavy duty spring isolation that can reduce sound levels by 3 dBA (see springs below).

Figure 1: Unit Without Enclosure



(RWXW360 shown)

Figure 2: Unit With Optional Enclosure



Remove wooden shipping skids

CAUTION: A minimum of 24 in. clearance should be allowed for service access.

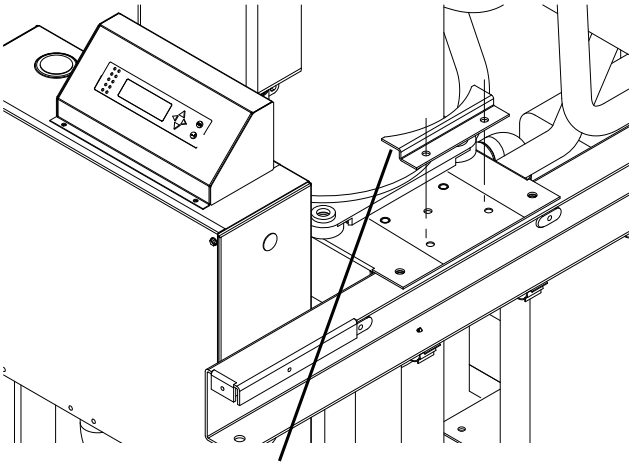
Grommets Standard

Heavy Duty Mounting Springs Optional
IS-325-01 (RWXW096-360)
IS-750-01 (RWXW540)

Unpacking the Unit

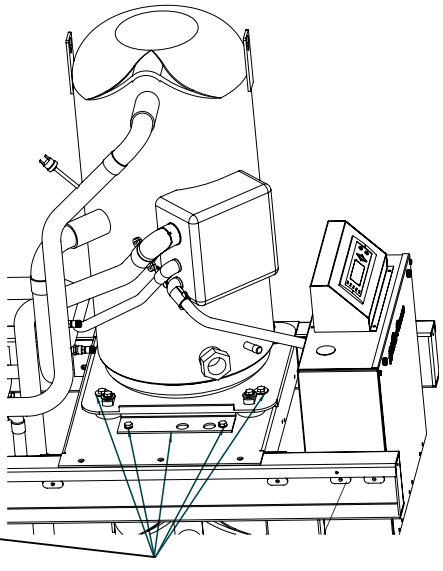
Remove the stretch warp and protective cardboard from the unit. Where applicable, remove the compressor shipping brackets located at the base of each compressor. To do so, lift up the bottom of the compressor sound jacket and remove the two bolts that hold the bracket (see Figure 3a). Discard the brackets. On RWXW540, the hold down shipping bolts should then be removed and discarded (Figure 3b).

Figure 3a: Removing Shipping Brackets



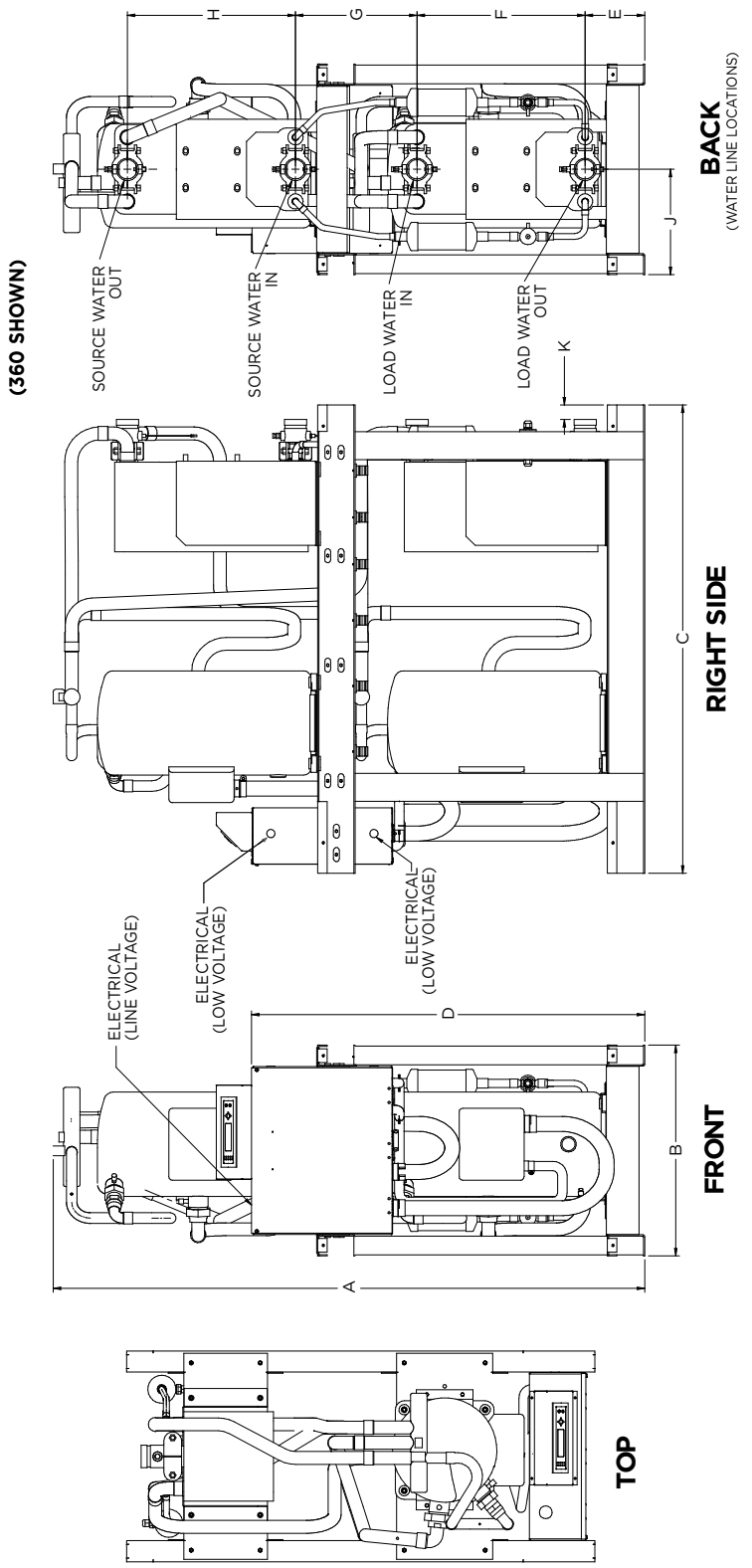
Compressor Shipping Bracket (one on each side of both compressors)

Figure 3b: Removing Shipping Bolts



Remove shipping bolts, brackets and all related hardware

Physical Dimensions Without Enclosure



Dimensional Data for unit without enclosure

Model	A	B	C	D	E	F	G	H	J	K
096-240	51.0 [1295]	22.5 [572]	38.0 [965]	35.1 [891]	6.1 [155]	17.0 [432]	7.9 [202]	17.0 [432]	11.2 [285]	1.5 [38]
360	63.2 [1605]	22.5 [572]	50.0 [1270]	42.0 [1067]	6.4 [162]	17.0 [432]	13.9 [354]	17.0 [432]	11.3 [286]	1.5 [39]
540	70.0 [1778]	22.5 [572]	52.0 [1321]	47.8 [1215]	6.5 [166]	17.0 [432]	19.5 [495]	17.0 [432]	14.3 [362]	0.8 [20]

All dimensions in inches, [mm]
All water connections are 2 in. Victaulic

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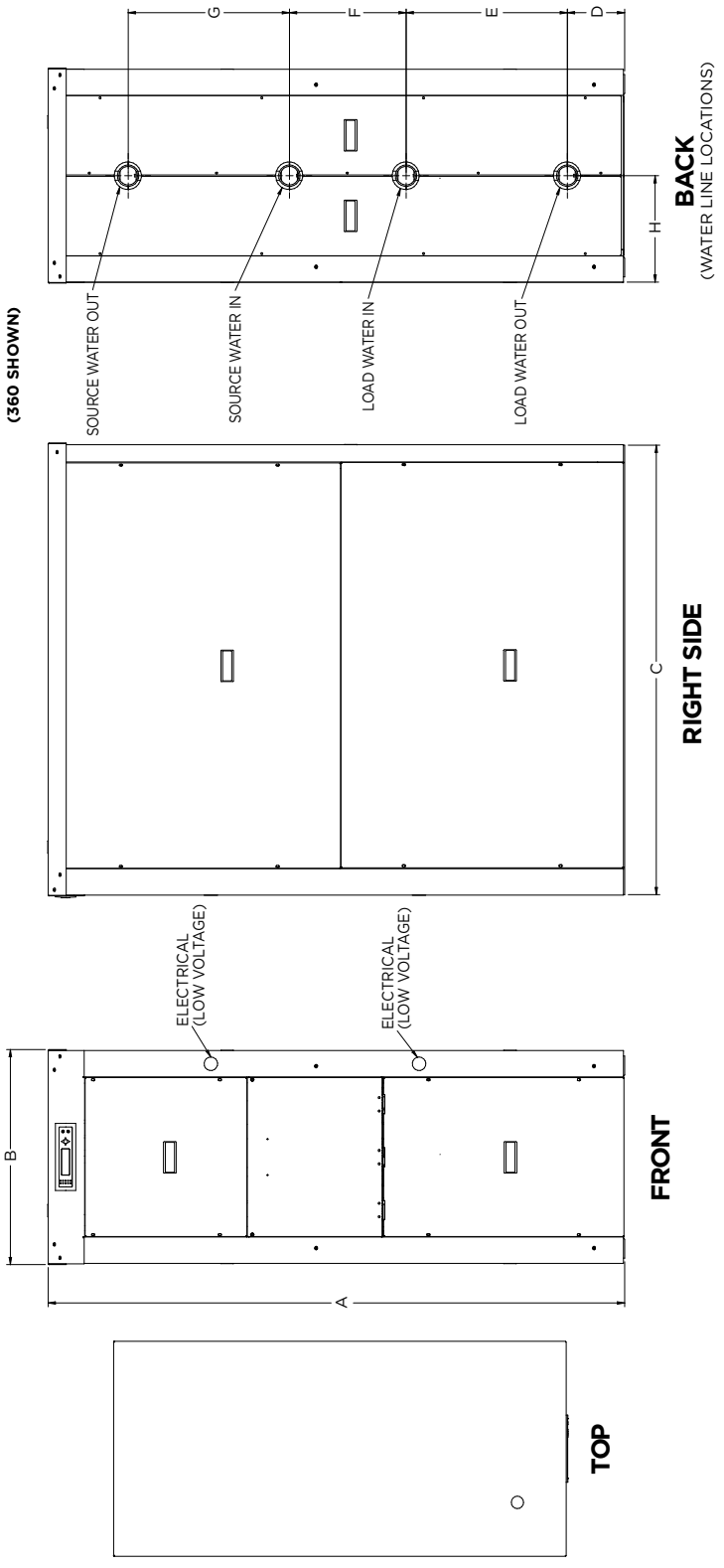
Physical Dimensions With Enclosure



Dimensional Data for unit with enclosure

Model	A	B	C	D	E	F	G	H
096-240	53.0 [1347]	22.4 [568]	38.0 [965]	6.1 [154]	17.0 [432]	7.9 [202]	17.0 [432]	11.2 [285]
360	64.2 [1620]	23.9 [608]	50.0 [1270]	6.4 [162]	17.0 [432]	13.9 [354]	17.0 [432]	11.8 [301]
540	71.0 [1803]	23.9 [607]	52.4 [1330]	6.5 [166]	17.0 [432]	19.5 [495]	17.0 [432]	14.9 [378]

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All dimensions in inches, [mm]
All water connections are 2 in. Victaulic

Physical Data

Model	Configuration	Compressor	Refrigerant Charge*	Total Weight		Corner Weights			
				Shipping	Installed	Front Left	Rear Left	Front Right	Rear Right
096	with enclosure	Scroll (2)	4.0 [1.8]	705 [320]	627 [284]	135 [61]	175 [79]	138 [63]	179 [81]
	without enclosure	Scroll (2)	4.0 [1.8]	625 [284]	547 [248]	115 [52]	155 [70]	118 [54]	159 [72]
108	with enclosure	Scroll (2)	4.3 [1.9]	705 [320]	627 [284]	135 [61]	175 [79]	138 [63]	179 [81]
	without enclosure	Scroll (2)	4.3 [1.9]	625 [284]	547 [248]	115 [52]	155 [70]	118 [54]	159 [72]
120	with enclosure	Scroll (2)	4.8 [2.2]	705 [320]	627 [284]	135 [61]	175 [79]	138 [63]	179 [81]
	without enclosure	Scroll (2)	4.8 [2.2]	625 [284]	547 [248]	115 [52]	155 [70]	118 [54]	159 [72]
140	with enclosure	Scroll (2)	6.3 [2.8]	733 [332]	655 [297]	142 [64]	182 [83]	145 [66]	186 [84]
	without enclosure	Scroll (2)	6.3 [2.8]	653 [296]	575 [261]	122 [55]	162 [73]	125 [57]	166 [75]
180	with enclosure	Scroll (2)	7.0 [3.2]	769 [349]	691 [313]	151 [69]	191 [87]	154 [70]	195 [88]
	without enclosure	Scroll (2)	7.0 [3.2]	689 [313]	611 [277]	129 [59]	171 [78]	124 [56]	175 [79]
210	with enclosure	Scroll (2)	7.5 [3.4]	825 [374]	747 [339]	165 [75]	205 [93]	168 [76]	209 [95]
	without enclosure	Scroll (2)	7.5 [3.4]	755 [343]	677 [307]	170 [77]	210 [95]	173 [78]	214 [97]
240	with enclosure	Scroll (2)	7.5 [3.4]	825 [374]	747 [339]	165 [75]	205 [93]	168 [76]	209 [95]
	without enclosure	Scroll (2)	7.5 [3.4]	755 [343]	677 [307]	170 [77]	210 [95]	173 [78]	214 [97]
360	with enclosure	Scroll (2)	12.3 [5.6]	1125 [510]	1047 [475]	255 [116]	263 [119]	260 [118]	269 [122]
	without enclosure	Scroll (2)	12.3 [5.6]	963 [437]	885 [401]	214 [97]	223 [101]	220 [100]	228 [103]
540	with enclosure	Scroll (2)	21.3 [9.6]	1920 [871]	1842 [836]	349 [158]	595 [270]	664 [301]	312 [142]
	without enclosure	Scroll (2)	21.3 [9.6]	1808 [820]	1730 [785]	321 [146]	567 [257]	636 [288]	284 [129]

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Weights shown in lbs [kg]
*Refrigerant per circuit in lbs [kg]
Add 24 lbs [11 kg] for fluid weight when full. (096-120)
Add 32 lbs [15 kg] for fluid weight when full. (140-180)
Add 48 lbs [22 kg] for fluid weight when full. (210-240)
Add 64 lbs [29 kg] for fluid weight when full. (360)
Add 110 lbs [50 kg] for fluid weight when full. (540)

Field Connected Water Piping

General

System piping should be kept as simple as possible to minimize the pressure drop, but hand valves should be field installed to facilitate unit servicing. The piping installation should provide service personnel with the ability to measure and/or monitor water temperatures and pressures.

Source and load fluid connections are provided with 2 in. [50.8 mm] Victaulic grooved nipples (see Figure 4). Each nipple will also have a PT port installed for test and balance purposes. It will be the installing contractor's responsibility to adequately support incoming piping to avoid damage to the unit's piping or heat exchangers. The water lines should be routed so as not to interfere with access to the unit.

For any installation where the transmission of vibration through the piping connections could cause unacceptable noise levels in occupied spaces it is important to provide adequate vibration damping. One method is to use the optional Adapter Hose Kit (kit number TKC16S-4). This Kit consists of four pieces of a braided stainless steel flexible hose with a 2 in. Victaulic connection on one end and a 2 in. MPT connection with pipe union on the other. Overall length of each piece is 18 in.

NOTE: Units are factory run-tested using propylene glycol. Prior to connecting piping to unit, thoroughly flush heat exchangers.

Figure 4: Water Connections (RWXW360 shown)

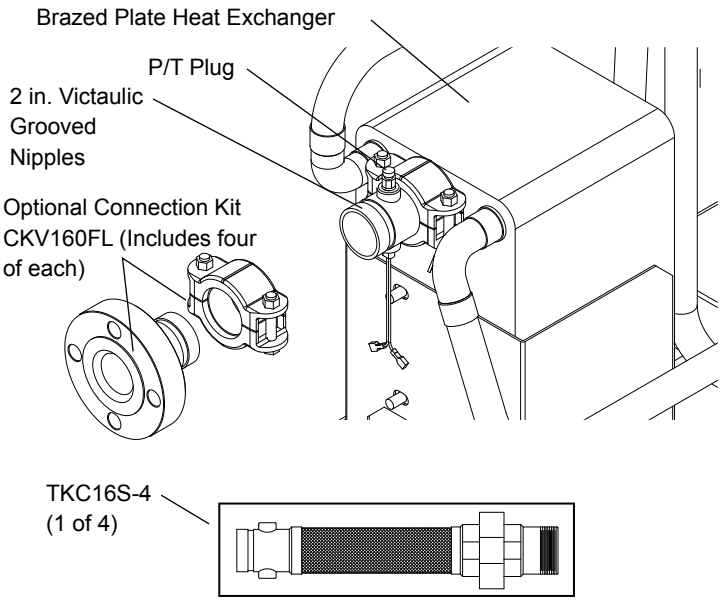
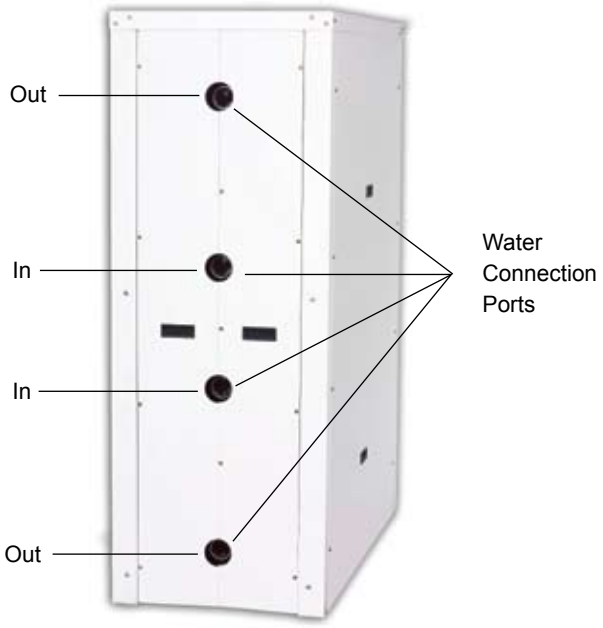

Brazed Plate Heat Exchanger
P/T Plug
2 in. Victaulic Grooved Nipples
Optional Connection Kit CKV160FL (Includes four of each)
TKC16S-4 (1 of 4)

Figure 5: Chiller Back View (RWXW360 shown)



CAUTION: Remove the plastic protective caps in the ends of each of the four water pipes on the heat exchangers prior to piping connection. Failure to remove the caps will result in serious damage and could void the warranty.

Field Connected Water Piping cont.

Before final connection to the unit, the supply and return hose kits must be connected to each other, bypassing the unit, and the system flushed to remove dirt, piping chips and other foreign material. Normally, a combination balancing and close-off (ball) valve is installed at the return, and a rated gate or ball valve is installed at the supply. The return valve can be adjusted to obtain the proper water flow. The valves allow the unit to be removed for servicing.

The proper water flow must be delivered to each unit whenever the unit heats or cools. The proper flow rate cannot be accurately set without measuring the water pressure drop through the refrigerant-to-water heat exchanger. **A 3 GPM flow rate per ton [0.054 LPS per kW] of cooling capacity (2.25 GPM per ton [0.0404 LPS per kW] minimum) is required.**

NOTE: The placement and connection of the water circulating pump(s) must be taken into consideration prior to designing the final water piping systems.

Closed Loop Tower/Boiler Systems

The water loop is usually maintained between 60°F [15.5°C] and 90°F [32.2°C] for proper heating and cooling operation. This is accomplished with a cooling tower and a boiler.

To reject excess heat from the condenser water loop, the use of a closed-circuit evaporative cooler or an open type cooling tower with a secondary heat exchanger between the tower and the condenser water loop is recommended. If an open type cooling tower is used without a secondary heat exchanger, continuous chemical treatment and filtering of the water must be performed to ensure the water is free from damaging materials.

CAUTION: Water piping exposed to outside temperature may be subject to freezing.

Open Loop Well Water Systems

Installation of an open loop system is not recommended without using a secondary heat exchanger unless water quality guidelines are met.

Earth Coupled Systems

All supply and return water piping should be insulated to prevent excess condensation from forming on the water lines. Ensure pumping system is capable of providing adequate flow rate at the system pressure drop, 3.0 GPM per ton [0.054 LPS per kW] (source side) is recommended. Antifreeze in the loop is strongly recommended.

Heating with High Source Temperatures

Heating water with a water to water unit using high source temperatures can lead to operating conditions that fall outside of the system operating range. The condition occurs when the loop (source) temperature exceeds 70°F [21.1°C] with a full flow of 3 GPM per ton [0.054 LPS per kW]. Under this scenario, the evaporating temperature can fall outside of the compressor operating window.

To allow the system to operate correctly, restricting the source side flow when the evaporating temperature exceeds 55°F [12.7°C] is recommended. One way of accomplishing this is to use a flow-restricting valve on the source loop circuit that is controlled by the evaporating temperature. Locate the sensing device on the refrigerant inlet of the evaporator. In dual circuit systems, the company recommends monitoring both circuits and controlling off the sensor that reads the highest temperature.

As an alternative to the evaporating temperature, the suction line temperature can be monitored with the same control capability. In this control, temperature should be a maximum of 65°F [18.3°C].

Water Quality

General

Reversible chiller systems may be successfully applied in a wide range of commercial and industrial applications. It is the responsibility of the system designer and installing contractor to ensure that acceptable water quality is present and that all applicable codes have been met in these installations.

Water Treatment

Do not use untreated or improperly treated water. Equipment damage may occur. The use of improperly treated or untreated water in this equipment may result in scaling, erosion, corrosion, algae or slime. The services of a qualified water treatment specialist should be engaged to determine what treatment, if any, is required. The product warranty specifically excludes liability for corrosion, erosion or deterioration of equipment.

The heat exchangers in the units are 316 stainless steel plates with copper brazing. The water piping in the heat exchanger is steel. There may be other materials in the building's piping system that the designer may need to take into consideration when deciding the parameters of the water quality.

If an antifreeze or water treatment solution is to be used, the designer should confirm it does not have a detrimental effect on the materials in the system.

Contaminated Water

In applications where the water quality cannot be held to prescribed limits, the use of a secondary or intermediate heat exchanger is recommended to separate the unit from the contaminated water.

The following table outlines the water quality guidelines for unit heat exchangers. If these conditions are exceeded, a secondary heat exchanger is required. Failure to supply a secondary heat exchanger where needed will result in a warranty exclusion for primary heat exchanger corrosion or failure.

Strainers

These units must have properly sized strainers upstream of both brazed plate heat exchangers to protect them against particles in the fluid. Failure to install proper stainers and perform regular service can result in serious damage to the unit, and cause degraded performance, reduced operating life and failed compressors. Improper installation of the unit (which includes not having proper strainers to protect the heat exchangers) can also result in voiding the warranty.

Field supplied strainers with 20-40 mesh (530-1060 microns) are recommended, with 30 mesh (800 microns) being the optimum choice. The strainers selected should have a mesh open area of at least 6 square inches (39 square centimeters) for each unit being serviced by the strainer. Using strainers with a smaller amount of open area will result in the need for more frequent cleaning.

Strainers should be selected on the basis of acceptable pressure drop, and not on pipe diameter. The strainers selected should have a pressure drop at the nominal flow rate of the units low enough to be within the pumping capacity of the pump being used.

WARNING: Must have intermediate heat exchanger when used in pool applications.

Water Quality Guidelines

Material		Copper	90/10 Cupro-Nickel	316 Stainless Steel
pH	Acidity/Alkalinity	7- 9	7 - 9	7 - 9
Scaling	Calcium and Magnesium Carbonate	(Total Hardness) less than 350 ppm	(Total Hardness) less than 350 ppm	(Total Hardness) less than 350 ppm
Corrosion	Hydrogen Sulfide	Less than .5 ppm (rotten egg smell appears at 0.5 PPM)	10 - 50 ppm	Less than 1 ppm
	Sulfates	Less than 125 ppm	Less than 125 ppm	Less than 200 ppm
	Chlorine	Less than .5 ppm	Less than .5 ppm	Less than .5 ppm
	Chlorides	Less than 20 ppm	Less than125 ppm	Less than 300 ppm
	Carbon Dioxide	Less than 50 ppm	10 - 50 ppm	10- 50 ppm
	Ammonia	Less than 2 ppm	Less than 2 ppm	Less than 20 ppm
	Ammonia Chloride	Less than .5 ppm	Less than .5 ppm	Less than .5 ppm
	Ammonia Nitrate	Less than .5 ppm	Less than .5 ppm	Less than .5 ppm
	Ammonia Hydroxide	Less than .5 ppm	Less than .5 ppm	Less than .5 ppm
	Ammonia Sulfate	Less than .5 ppm	Less than .5 ppm	Less than .5 ppm
	Total Dissolved Solids (TDS)	Less than 1000 ppm	1000-1500 ppm	1000-1500 ppm
	LSI Index	+0.5 to -.05	+0.5 to -.05	+0.5 to -.05
Iron Fouling (Biological Growth)	Iron, Fe^{2+} (Ferrous) Bacterial Iron Potential	< .2 ppm	< .2 ppm	< .2 ppm
	Iron Oxide	Less than 1 ppm. Above this level deposition will occur.	Less than 1 ppm. Above this level deposition will occur.	Less than 1 ppm. Above this level deposition will occur.
Erosion	Suspended Solids	Less than 10 ppm and filtered for max of 600 micron size	Less than 10 ppm and filtered for max of 600 micron size	Less than 10 ppm and filtered for max of 600 micron size
	Threshold Velocity (Fresh Water)	< 6 ft/sec	< 6 ft/sec	< 6 ft/sec

Grains = PPM divided by 17 • mg/l is equivalent to PPM

2/8/08

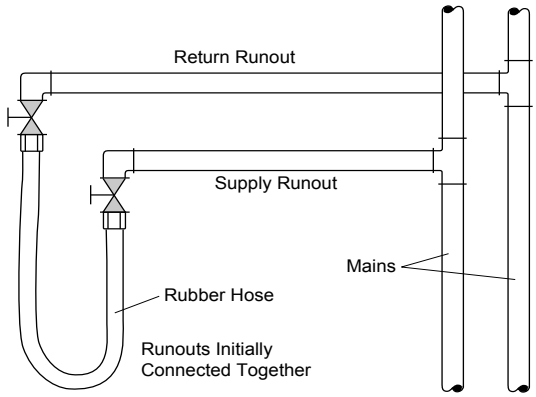
System Cleaning and Flushing

Cleaning and Flushing

Prior to start up of any heat pump, the water circulating system must be cleaned and flushed of all dirt and debris.

If the system is equipped with water shutoff valves, the supply and return runouts must be connected together at each unit location (This will prevent the introduction of dirt into the unit, see Flushing with Water Shutoff Valve Equipped Systems illustration). The system should be filled at the water make-up connection with all air vents open. After filling, vents should be closed.

Flushing with Water Shutoff Valve Equipped Systems



The contractor should start the main circulator with the pressure reducing valve makeup open. Vents should be checked in sequence to bleed off any trapped air and to verify circulation through all components of the system.

As water circulates through the system, the contractor should check and repair any leaks found in the piping system. Drain(s) at the lowest point(s) in the system should be opened for initial flush and blowdown, making sure water fill valves are set at the same rate. Check the pressure gauge at the pump suction and manually adjust the make-up water valve to hold the same positive pressure both before and after opening the drain valves. Flushing should continue for at least two hours, or longer if required, until drain water is clean and clear.

The supplemental heater and/or circulator pump, if used, should be shut off. All drains and vents should be opened to completely drain the system. Short-circuited supply and return runouts should now be connected to the unit supply and return connections.

Refill the system with clean water. Test the system water for acidity and treat as required to leave the water slightly alkaline (pH 7.5 to 8.5). The specified percentage of antifreeze may also be added at this time. Use commercial grade antifreeze designed for HVAC systems only. Environol™ brand antifreeze is recommended.

Once the system has been filled with clean water and antifreeze (if used), precautions should be taken to protect the system from dirty water conditions. Dirty water will result in system-wide degradation of performance, and solids may clog valves, strainers, flow regulators, etc. Additionally, the heat exchanger may become clogged which reduces compressor service life and can cause premature unit failure.

In boiler/tower application, set the loop control panel set points to desired temperatures. Supply power to all motors and start the circulating pumps. After full flow has been established through all components including the heat rejector (regardless of season), air vented and loop temperatures stabilized, each of the units will be ready for check, test and start up and for air and water balancing.

Ground Source Loop System Checkout

Once piping is completed between the unit pumping system and ground loop, final purging and charging of the loop is needed. A high pressure pump is needed to achieve adequate flow velocity in the loop to purge air and dirt particles from the loop itself. Antifreeze solution is used in most areas to prevent freezing. Flush the system adequately to remove as much air as possible; then pressurize the loop to a static pressure of 40-50 PSI (summer) or 50-75 PSI (winter). This is normally adequate for good system operation. Loop static pressure may decrease soon after initial installation, due to pipe expansion and loop temperature change. Running the unit for at least 30 minutes after the system has been completely purged of air will allow for the “break-in” period. It may be necessary to adjust static loop pressure (by adding water) after the unit has run for the first time. Loop static pressure will also fluctuate with the seasons. Pressures will be higher in the winter months than during the cooling season. This fluctuation is normal and should be considered when charging the system initially.

Ensure the pump provides adequate flow through the unit by checking pressure drop across the heat exchanger.
Usually 2.25-3.0 GPM of flow per ton of cooling capacity is recommended in earth loop applications.

Electrical Data

Model	Rated Voltage	Voltage Min/Max	Compressor*			Total Unit FLA	Min Circ Amp	Max Fuse/HACR
			MCC	RLA	LRA			
096	208-230/60/3	187/253	24.9	15.9	110.0	31.9	36.0	50
	460/60/3	414/506	12.1	7.7	52.0	15.4	17.3	25
	575/60/3	517/633	8.9	5.7	38.9	11.4	12.8	15
108	208-230/60/3	187/253	28.0	17.3	120.0	34.6	38.9	50
	460/60/3	414/506	15.0	9.6	70.0	19.2	21.6	30
	575/60/3	517/633	12.5	8.0	53.0	16.0	18.0	25
	380/60/3	342/418	14.1	9.0	94.0	18.0	20.3	25
120	208-230/60/3	187/253	35.0	22.4	149.0	44.8	50.4	70
	460/60/3	414/506	16.5	10.6	75.0	21.2	23.9	30
	575/60/3	517/633	12.0	7.7	54.0	15.4	17.3	25
	380/60/3	342/418	17.1	11.0	88.0	22.0	24.8	35
140	208-230/60/3	187/253	35.0	22.4	190.0	44.8	50.4	70
	460/60/3	414/506	19.0	12.2	87.0	24.4	27.5	35
	575/60/3	517/633	15.0	9.6	62.0	19.2	21.6	30
	380/60/3	342/418	19.0	12.2	73.0	24.4	27.5	35
180	208-230/60/3	187/253	45.0	26.6	235.0	53.2	59.9	80
	460/60/3	414/506	19.0	12.2	110.0	24.4	27.5	35
	575/60/3	517/633	16.5	10.9	95.0	21.8	24.5	35
	380/60/3	342/418	26.0	16.7	123.0	33.4	37.6	50
210	208-230/60/3	187/253	47.0	31.0	235.0	62.0	69.8	100
	460/60/3	414/506	25.0	16.0	110.0	32.0	36.0	50
	575/60/3	517/633	17.3	11.9	95.0	23.8	26.8	35
	380/60/3	342/418	30.0	19.2	140.0	38.4	43.2	60
240	208-230/60/3	187/253	52.2	35.2	250.0	70.4	79.2	110
	460/60/3	414/506	27.0	19.2	140.0	38.4	43.2	60
	575/60/3	517/633	19.1	14.5	100.0	29.0	32.6	45
	380/60/3	342/418	37.0	23.7	145.0	47.4	53.3	70
360	208-230/60/3	187/253	87.0	55.8	340.0	111.5	125.5	175
	460/60/3	414/506	42.0	26.9	173.0	53.8	60.6	80
	575/60/3	517/633	37.0	23.7	132.0	47.4	53.4	70
	380/60/3	342/418	53.0	34.0	196.0	67.9	76.4	100
540	460/60/3	414/506	67.0	42.9	250.0	85.8	96.5	125
	575/60/3	517/633	50.0	32.0	198.0	64.0	72.0	100
	380/60/3	342/418	85.0	54.4	305.0	108.8	122.4	175

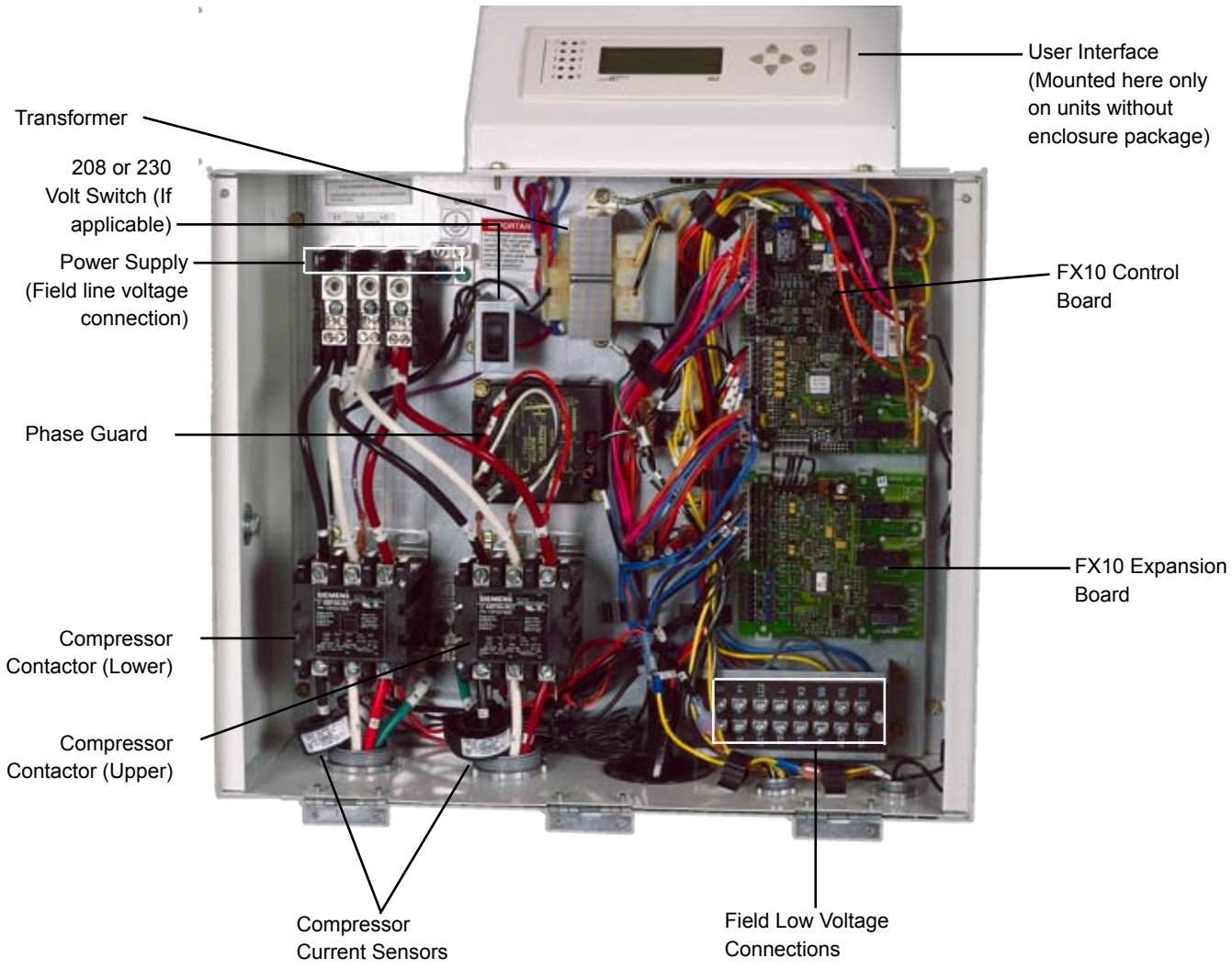
3/9/09

HACR circuit breaker in USA only.

* - MCC, RLA, & LRA rating per compressor. Breaker and FLA sized for both compressors.

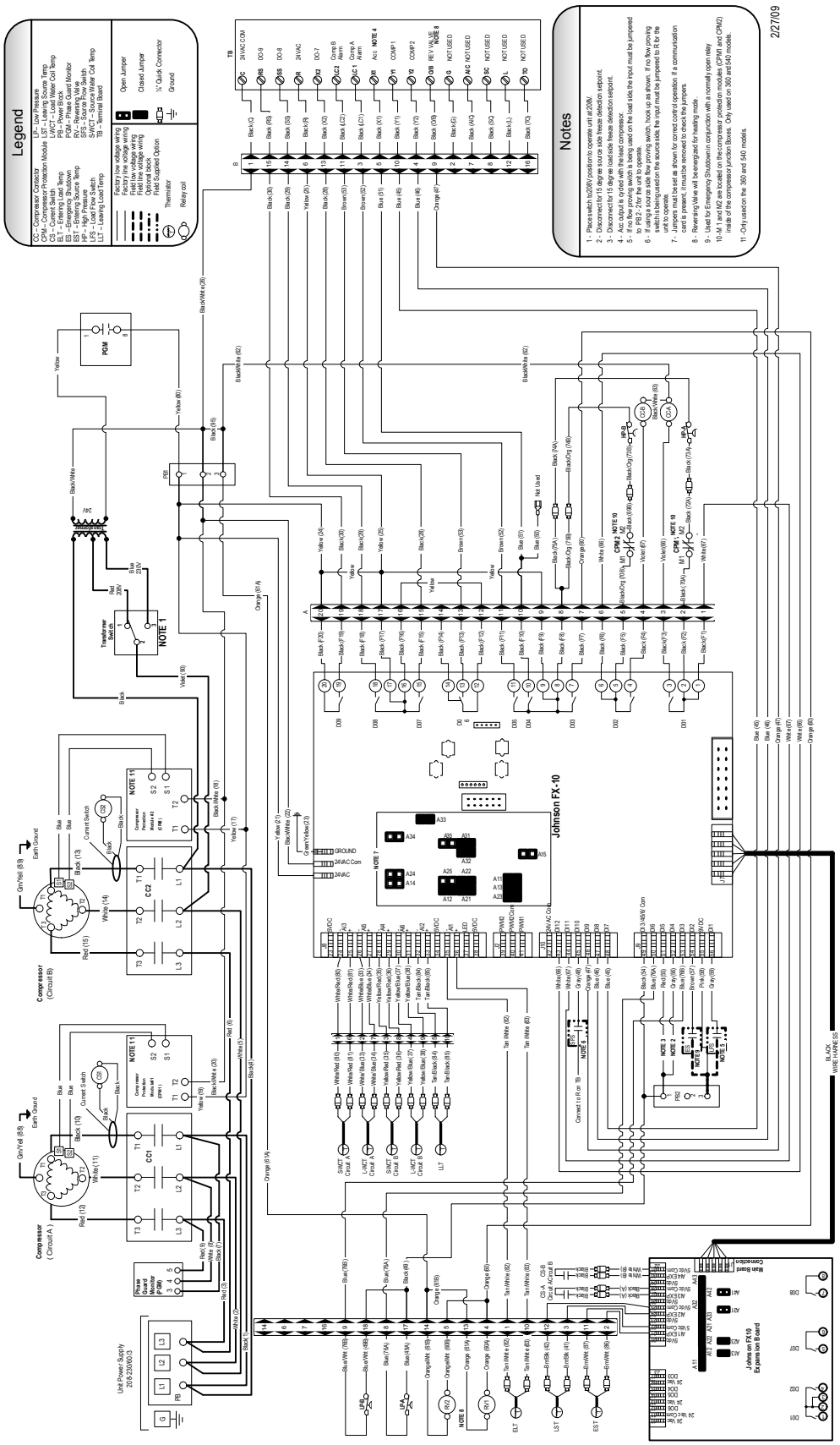
Electrical Data cont.

Figure 6: Control Box



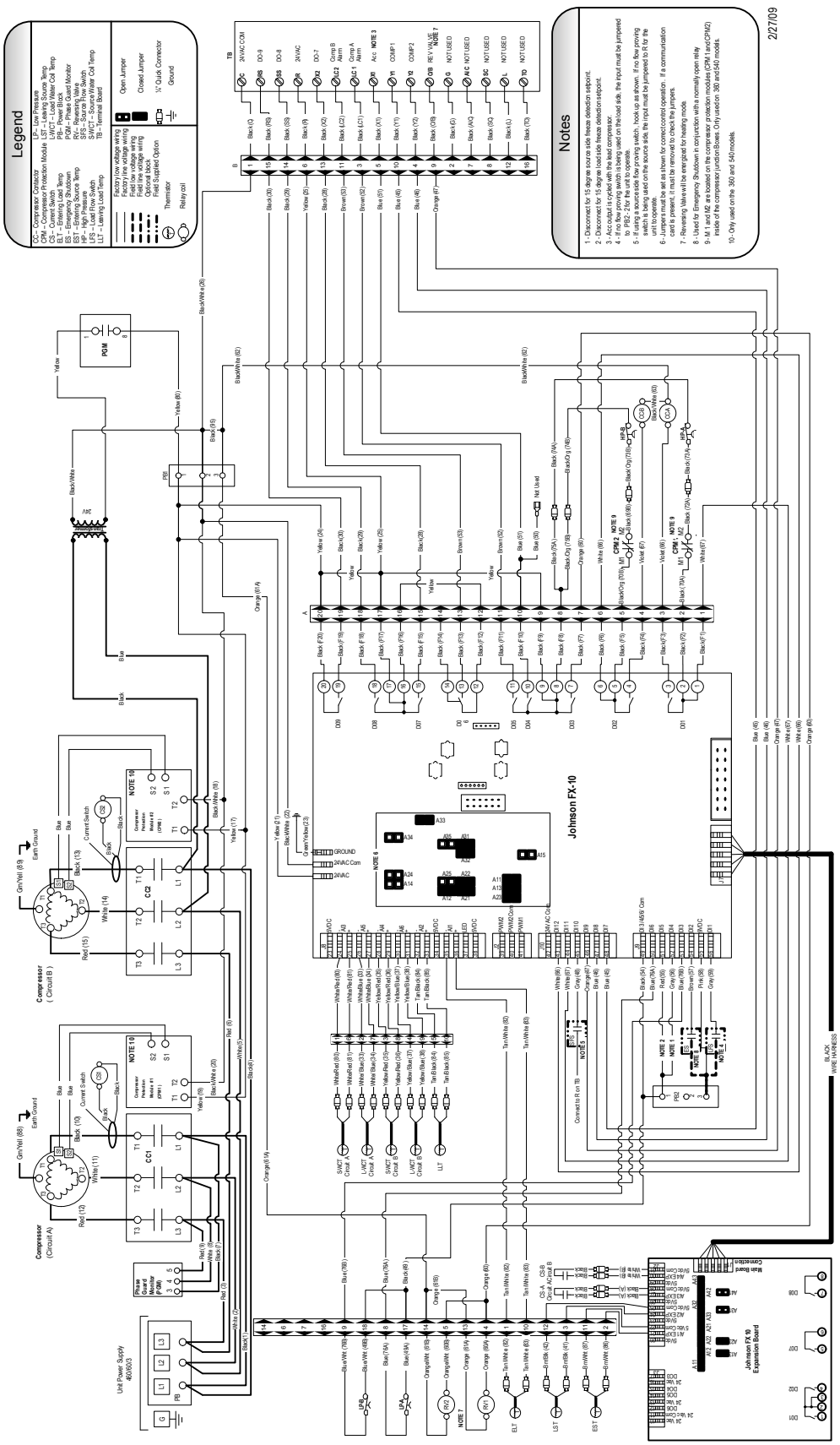
Wiring Schematics

208-230/60/3



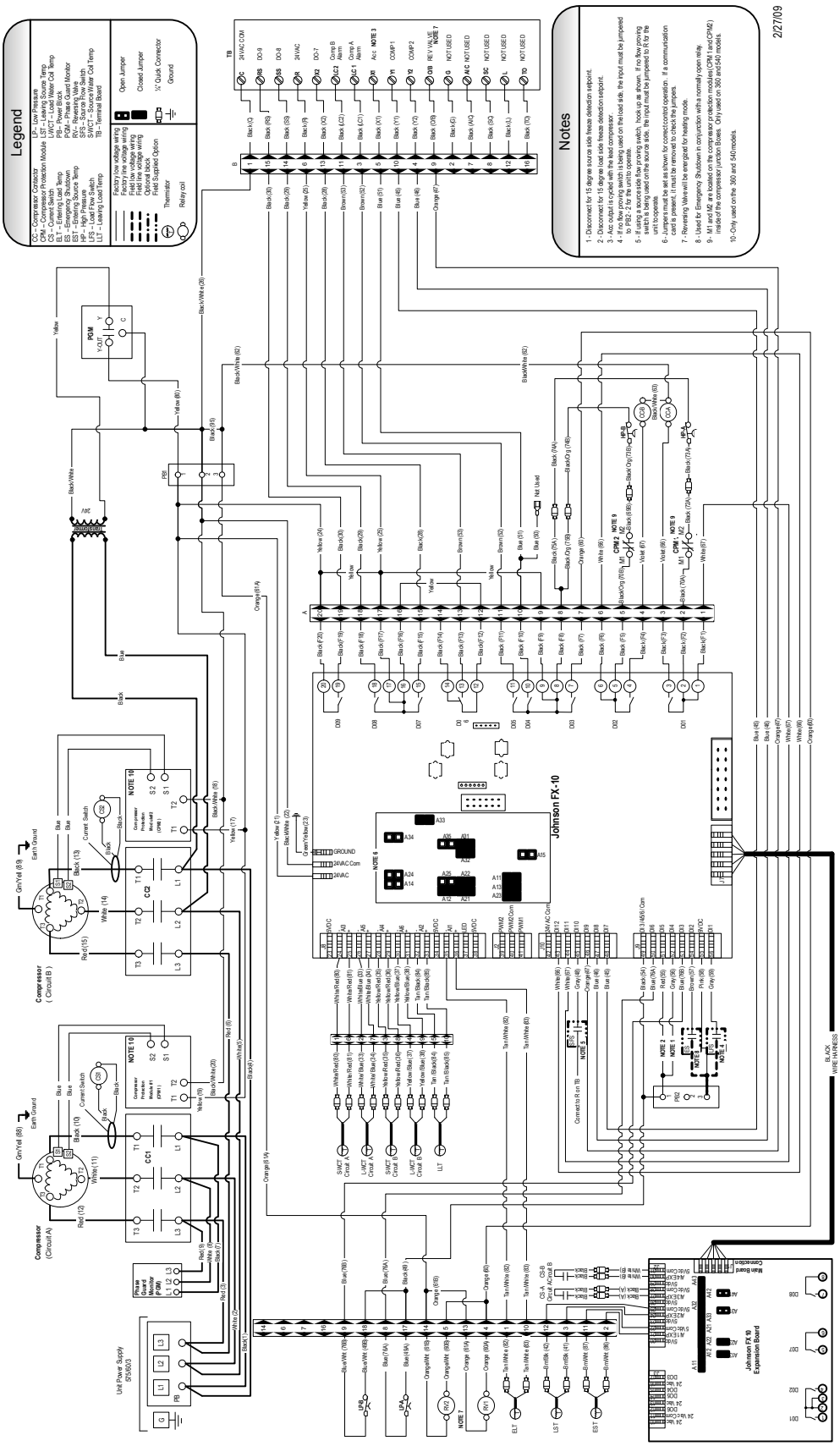
Wiring Schematics cont.

460/60/3



Wiring Schematics cont.

575/60/3



Field Wiring and Control Setup

Figure 8a & 8b - High Voltage Connections

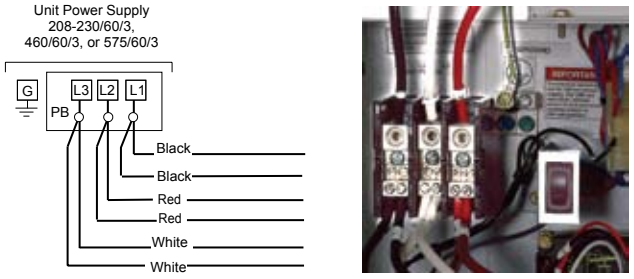
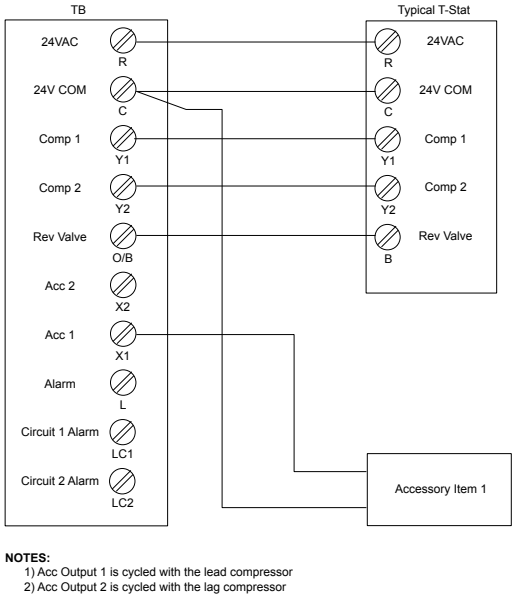
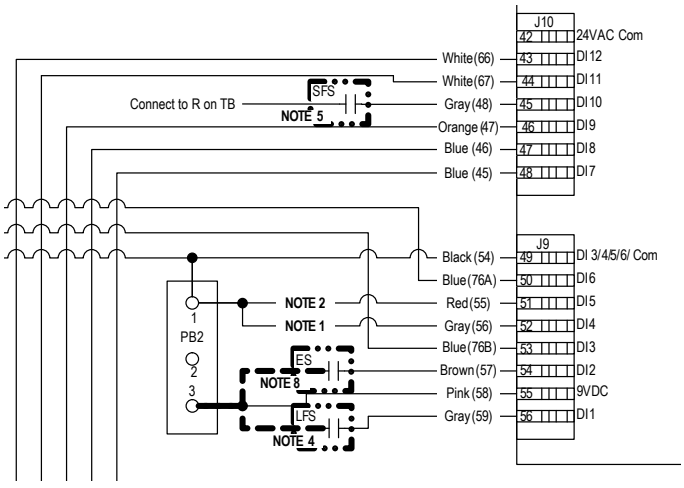


Figure 9 - Low Voltage Connections



NOTES:
1) Acc Output 1 is cycled with the lead compressor
2) Acc Output 2 is cycled with the lag compressor

Figure 10 - Wiring Schematic



Line Voltage

High Voltage Connections

Connect power wiring as shown in Figure 8a and 8b.

208 Volt Operation

For 208V operation, select 208V on transformer switch as shown in Figure 8b.

Low Voltage Operation

Thermostat/Controller (Aquastat)

A two-stage 24 VAC thermostat or liquid controller (field supplied) must be used to turn the reversible chiller on or off, and to switch it from cooling to heating if necessary. Multiple chillers in the same bank must be controlled from one thermostat/controller (must be isolation relays for multiple unit applications).

Low Voltage Connections

Connect low voltage thermostat wiring as shown in Figure 9. Connections shown are for typical thermostat. Actual connections may vary with specific device used.

NOTE: If a separate transformer is used to supply a Y1, Y2, or B signal to the unit controls, isolation relays must be used.

CAUTION: Use only copper conductors for field installed wiring. Terminals in the unit are not designed for other types of conductors.

WARNING: All wiring must comply with local and state codes. Disconnect the power supply before beginning to wire to prevent electrical shock or equipment damage.

NOTE: Accessory 1 output is selectable as normally open or normally closed using the unit display. Normally closed is the factory default setting.

Source Flow Switch (SFS)

Unit is factory shipped with no connections on Flow Switch pins J10-45 (entering). If flow proving switch is required, hook up as shown in Fig. 10 and Note 5. The unit will not operate with out a flow proving switch installed.

Load Flow Switch (LFS)

Unit is factory shipped with no connections on Flow Switch pins J9-56 (leaving). If flow proving switch is required, hook up as shown in Fig. 10 and Note 4. The unit will not operate with out a flow proving switch installed.

ATTENTION: Flow Switches must be installed before unit will operate!

Field Wiring and Control Setup cont.

Accessory Relay Setup

The accessory output set to “close” upon Y1 compressor call (compressor is delayed 90 sec. after Y1) but can be set to “open” with Y1.

To change ACC1 or ACC2: (ACC1 shown)

- On FX10 control using the left and right arrow keys, scroll to “PASSWORD” menu (password “5667”)
- Once you have entered the password scroll to “MAINT” menu.
- Using up and down keys, scroll to “Acc 1 Sel” hit “ENTER” and “ON Comp” begins flashing
- Using up and down keys, select “ON Comp” for actuation with Y1 Call or “OFF Comp” for deactivation with Y1

Lead/Lag Selection

Compressor Lead/Lag Selection is factory set to “OFF” but can be set to “ON”.

To change Lead/Lag On/Off:

- On FX10 control using the left and right arrow keys, scroll to “PASSWORD” menu (password “5667”)
- Once you have entered the password scroll to “MAINT” menu
- Using up and down keys, scroll to “LEAD/LAG SELECT” hit “ENTER” and “OFF” begins flashing
- Using up and down keys, select “ON” for activation or “ OFF” for deactivation

Lead/Lag Time - Runtime in Hours

Compressor Lead/Lag Time is factory set “100” hours but can be set from 1 to 100 hours.

To change Lead/Lag Time:

- On FX10 control using the left and right arrow keys, scroll to “PASSWORD” menu (password “5667”)
- Once you have entered the password scroll to “MAINT” menu.
- Using up and down keys, scroll to “LEAD/LAG TIME” hit “ENTER” and “LEAD/LAG TIME begins flashing
- Using up and down keys, select 1 - 100 HOURS.

°F or °C - Unit of Measure

Degrees Fahrenheit is factory set, however degrees Celsius can be selected using the following procedure:

To Change Unit of Measure:

- On FX10 control using up and down keys, scroll to “SETTINGS”
- Using up and down keys, scroll to “UNIT OF MEASURE” hit “ENTER” and “UNIT OF MEASURE” begins flashing
- Using up and down keys, select “F” for degrees Fahrenheit or “C” for degrees Celsius

Other Field Options

Other field selectable options are available as shown in the maintenance menu on page 20 of the FX10 control using a similar procedure as shown in the above examples. These would include thermostat enabling, and emergency shutdown. See page 20 for details.

Control Features

Anti Short Cycle
High Pressure Protection
Low Pressure Protection
Advanced Freeze Detection Setpoint
Random Start
Display for diagnostics
Reset Lockout at disconnect
Intelligent reset for field installed flow switches
1 Accessory output
Optional DDC control add-on
Compressor Lead/Lag
Compressor Current Switches

Field Selectable Options

Freeze Detection Sensing Select (DI-4 and DI-5)

The freeze detection temperature sensing selection inputs allow the user to adjust the setpoints. The source sensors are wired to inputs AI-3 and AI-4 while the load sensors are wired to inputs AI-5 and AI-6. The setpoints for both, the load and source, are factory set for 30°F. In order to change the setpoint to 15°F on the source, remove the jumper wire from DI-4 (wire #56). The load setpoint can be changed by removing the jumper wire from DI-5 (wire #55).

Accessory Output (DO-4)

The accessory Output will be energized 90 seconds prior to the lead compressor output being energized. When the lead compressor output is turned off the accessory output will be deactivated immediately. The output is selectable for normally open or normally closed operation through the unit mounted user interface or from a building automation system.

Control and Safety Features

Emergency Shutdown

The emergency shutdown mode can be activated by a command from a facility management system or a closed contact on DI-2. The default state for the emergency shutdown data point is off. When the emergency shutdown mode is activated, all outputs will be turned off immediately and will remain off until the emergency shutdown mode is de-activated. The first time the compressor starts after the emergency shutdown mode has been de-activated, there will be a random start delay present.

Lockout Mode

Lockout mode can be activated by any of the following fault signals: refrigerant system high pressure, refrigerant system low pressure, heating freeze detection, cooling freeze detection, and compressor current sensor. When any valid fault signal remains continuously active for the length of its recognition delay, the controller will go into fault retry mode, which will turn off the compressor. After the Compressor short cycle delay, the compressor will attempt to operate once again. If three consecutive faults are recognized during a single heating or cooling demand, the unit will go into lockout mode, turning off the compressor and enabling the alarm output until the controller is reset. The fault count will automatically reset when the heating or cooling command becomes satisfied. If a fault occurs on a dual compressor unit, the other compressor will continue to operate based on the heating or cooling demand. The lockout condition can be reset by powering down the controller, by a command from the facility management system, or by holding both the enter and escape keys on the optional user interface.

Reversible Chiller Advanced Freeze Detection System

The reversible chiller source and load heat exchangers are protected by a multi-sourced temperature logic strategy. The temperature logic is based upon the refrigerant temperature sensed as the refrigerant is about to enter the heat exchanger; while entering and leaving water temperatures are being used as correlating factors. The detection scheme is shown as basic and advanced algorithms.

Basic Freeze Detection Operation: “Comp1 or Comp2 Freeze” Alarm

This alarm can be triggered by one of two detection schemes.

Hard Limit Freeze Detection
If the refrigerant temperature drops below the freeze detection setpoint by 1.8°F, the associated compressor is locked out immediately regardless of any other factors and requires a manual reset. **NOTE: This Lockout produces a “Comp 1 or Comp 2 Freeze” error on the MUI display.**

Freeze Detection
The refrigerant temperature is compared to the freeze detection setpoint (15°F [antifreeze] or 33°F [water] field selectable), and if the temperature falls below the setpoint for 30 continuous seconds, the associated compressor will be halted. This function becomes enabled after the first two minutes of compressor operation. Three such events in 60 minutes will trigger a compressor lockout that requires a manual reset. **NOTE: This Lockout produces a “Comp 1 or Comp 2 Freeze” error on the MUI display.**

In addition to the above:
Entering Water Temperature Influence
If the entering water temperature of the evaporative heat exchanger is within 10°F of the freeze setpoint, the previously mentioned two minute delay will be eliminated. This allows the freeze detection to operate immediately when the compressor starts based on entering water temperature.

Leaving Water Temperature Influence
If the leaving water temperature of the evaporative heat exchanger is within 10°F of the freeze setpoint, the previously mentioned 30 second delay will begin to be proportionately reduced, ending at a 1 second delay when the leaving water temperature is 1.5°F above the freeze setpoint.

Control Features cont.

Dual Circuited Heat Exchanger Protection

A low temperature condition on either refrigerant circuit will prevent the start of both compressors. If the low temperature condition exists for 5 minutes when both compressors are off, a lockout is triggered for both compressors. However, if –for instance-both compressors are operating and circuit 1 experiences a refrigerant temperature below the freeze detection setpoint such that compressor 1 is halted, compressor 2 will not be halted as a result.

Advanced Freeze Detection Operation: "Pre Freeze" Alarm

Predictive freeze condition detection:

If the refrigerant temperature is within 7.2°F of the freeze detection setpoint, the predictive freeze detection algorithm is enabled, and if the logic determines that a freeze condition is likely to happen based on current conditions, the compressor of the involved refrigerant circuit is immediately stopped. Three (3) such events in 60 minutes will trigger a compressor lockout that requires a manual reset. In the absence of such a condition, the compressor is allowed to operate so that the refrigerant temperature may eventually be at the threshold of the freeze detection setpoint. **NOTE: This Lockout produces a "Pre Freeze" detection error on the MUI display.**

Capacity Limiting

If the leaving water temperature drops to 1.8°F above the freeze detection setpoint, the lead compressor is halted. When the leaving water temperature rises to 3.6°F above the freeze detection setpoint, it will be allowed to resume operation. This limiting is allowed to repeat indefinitely with no lockout or indication on the display.

If the leaving water temperature drops to the freeze detection setpoint, the lag compressor is halted. When the leaving water temperature rises to 1.8°F above the freeze detection setpoint, it will be allowed to resume operation. This limiting is allowed to repeat indefinitely with no lockout or indication on the display.

Compressor Current Switch (AI-3 EXP and AI-4 EXP)

The compressor current switch is designed to insure that the compressor is on when the compressor output is energized. This switch is normally open and closes when current is flowing to the compressor. If the compressor fails to start the switch will open. The switch must be open for a continuous 5 seconds for a fault to occur. After 3 faults in 60 minutes the control will put the unit into an alarm state.

Flow Proving Switch (DI-1 and DI-10)

The load and source flow-proving switches are a field installed option. These switches shall be normally open flow switches that will close when the water flow through the heat exchangers reach an acceptable level. The flow-proving switches must be closed 15 seconds prior to enabling either compressor output (DO-2 and DO-4). If the load flow-proving switch opens at any time both compressor outputs (DO-2 and DO-4) must be disabled immediately.

High Pressure (DI-11 and DI-12)

The high-pressure switches shall be a normally closed (NC) switch that monitors the systems compressor discharge refrigerant pressures. There shall be an individual high pressure switch for each circuit. If the input senses the high-pressure switch is open during the period that the compressor output is enabled, it must shut down the compressor immediately and count the fault. The compressor minimum on time does not apply if the high-pressure switch trips. The compressor will not restart until the short cycle time delay has been satisfied. If the high-pressure fault occurs in one circuit the other compressor will continue to operate based on the heating or cooling demand.

Low Pressure (DI-3 and DI-6)

The low-pressure switches shall be a normally closed (NC) switch that monitors the systems compressor suction line refrigerant pressure. The input shall be checked 15 seconds before compressor start up to insure the pressure switch is closed and then ignored for the first 2 minutes after the compressor output (DO-1 or DO-2) is enabled. If the switch is open continuously for (30) seconds the compressor output for that circuit will be disabled. The compressor will not restart until the short cycle time delay has been satisfied. If a low-pressure fault occurs in one circuit the other compressor will continue to operate based on the heating or cooling demand.

Compressor 1 Alarm Output (DO-5)

The compressor 1 alarm output will be enabled when stage 1 is in the lockout mode and will be disabled when the lockout is reset.

Compressor 2 Alarm Output (DO-6)

The compressor 2 alarm output will be enabled when stage 2 is in the lockout mode and will be disabled when the lockout is reset.

Test Mode

The unit controls system can be put into test mode to eliminate startup delays to aid in trouble shooting. To put the unit into test mode hold the "ESC" and "Down Arrow" keys until LED 8 begins to flash. The control will remain in test mode until power is cycled or after 30 minutes.

Sequence of Operation

Power Fail Restart

When the controller is first powered up, the outputs will be disabled for a random start delay time (See Section 4.2). The delay is provided to prevent simultaneous starting of multiple heat pumps. Once the timer expires, the controller will operate in the occupied mode until it is commanded to another mode by a facility management system or a remote thermostat. A restart status variable is available for indication of this occurrence.

Random Start Delay

This delay will be used after every power failure, as well as the first time the compressor(s) is started after the control exits the emergency shutdown mode. The default time period for the start delay will be random between 1 and 120 seconds.

Compressor Fixed On Delay Time

The Compressor Fixed On Delay Time will ensure that the compressor output is not enabled for (90) seconds after the control receives a call to start the compressor.

Compressor Minimum On Delay

The compressor minimum on delay will ensure that the compressor output(s) are enabled for a minimum of (2) minute each time the compressor output is enabled. This will apply in every instance except in the event the high-pressure switch is tripped or emergency shutdown, then the compressor output will be disabled immediately.

Compressor Short Cycle Delay Time

The compressor short cycle time delay will ensure that the compressor output will not be enabled for a minimum of (5) minutes after it is disabled. This allows for the system refrigerant pressures to equalize after the compressor is disabled.

Compressor Stage Lead Lag

The factory setup software, a facility management system, Service/ Commissioning Tool, or a user interface can be used to select compressor lead lag option for the compressors. The factory setup software, a facility management system, Service/Commissioning Tool, or a user interface must also be used to select the number of run time hours the compressors will lead before being switched, the factory default will be 24 hours. The two compressors will still be staged depending on load when the lead lag option is enabled.

Heating Cycle

During the heating cycle, the reversing valves will be positioned for heating operation. The thermostat or aquastat will command the reversing valves “On” for heating. If the compressor short cycle time delay has been satisfied, the lead compressor will turn on after the accessory output has been enabled, the low pressure switches has been verified, and the fixed compressor start delay timer has been satisfied. When heating is no longer required, the compressor will be turned off immediately after the compressor minimum on delay has been satisfied. After the compressor output is turned off, it will remain off for the time specified in the compressor short cycle time delay. If the dual compressor option is selected, the compressors will be sequenced to maintain the heating setpoint. As the temperature drops below the heating setpoint and begins to operate in the heating proportional band, the first stage compressor will be activated. If the first stage compressor is not able to satisfy the heating demand, the second stage compressor will be activated by the thermostat or aquastat. The controller is allowed to operate the heat pump in the heating mode regardless of the outdoor air temperature.

Cooling Cycle

During the cooling cycle, the reversing valves will be positioned for cooling operation. The thermostat or aquastat will command the reversing valves “Off” for cooling. If the compressor short cycle time delay has been satisfied, the lead compressor will turn on after the accessory output has been enabled, the low pressure switches has been verified, and the fixed compressor start delay timer has been satisfied. When cooling is no longer required, the compressor will be turned off immediately after the compressor minimum on delay has been satisfied. After the compressor output is turned off, it will remain off for the time specified in the compressor short cycle time delay. If the dual compressor option is selected, the compressors will be sequenced to maintain the cooling setpoint. As the temperature drops below the cooling setpoint and begins to operate in the cooling proportional band, the first stage compressor will be activated. If the first stage compressor is not able to satisfy the cooling demand, the second stage compressor will be activated by the thermostat or aquastat. The controller is allowed to operate the heat pump in the cooling mode regardless of the outdoor air temperature.

Inputs and Outputs Configuration

DUAL STAGE WW			
Input Name	**Input**	**Output Name**	**Output**
Entering Load Water Temperature	AI 1	Compressor 1	DO1
Leaving Load Water Temperature 1	AI 2	Compressor 2	DO2
Source Heating Freeze Detection 1	AI 3	Reversing Valve	DO3
Source Heating Freeze Detection 2	AI 4	Accessory	DO4
Load Cooling Freeze Detection 1	AI 5	Compressor 1 Alarm	DO5
Load Cooling Freeze Detection 2	AI 6	Compressor 2 Alarm	DO6
		Network Output	DO7
Load Flow Proving Switch	DI 1	Network Output	DO8
Emergency Shutdown	DI 2	Network Output	D09
Stage 2 Low Pressure	DI 3		
Source Htg Freeze Detection Select - 30ºF	DI 4	Future	PWM1
Load Htg Freeze Detection Select - 30ºF	DI 5	Future	PWM2
Stage 1 Low Pressure	DI 6		
Thermostat Y1	DI 7		
Thermostat Y2	DI 8		
Thermostat B	DI 9		
Source Flow Proving Switch	D10		
Stage 1 High Pressure	DI11		
Stage 2 High Pressure	DI12		
XP10 Expansion Card			
Input Name	**Input**	**Output Name**	**Output**
Entering Source Water Temperature	AI 1	Unused	DO 1
Leaving Source Water Temperature 1	AI 2	Unused	DO 2
Current Switch 1 - Compressor 1	AI 3	Unused	DO 3
Current Switch 2 - Compressor 2	AI 4	Unused	DO 4

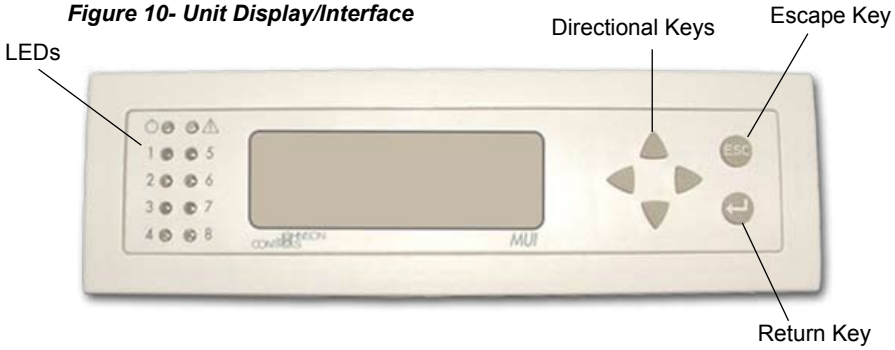
Unit Display and Interface

The Unit Display allows the user to view entering and leaving water temperatures, freeze detection readings, inputs and outputs, and allows the user enable and disable certain control functions through the various menus. The interface also displays all faults on the LCD once the unit has locked out to aid in diagnostics.

There are 10 LED indicator lights that indicate the following:

- ⏻ Power - Shows that the FX processor is operational
- ⚠ Alarm - Lights when there is a lock-out or faulty freeze detection sensor
- 1 - Flashing shows Compressor 1 is running
- 2 - Flashing shows Compressor 2 is running
- 3 - On shows Compressor 2 is lead
- 4 - On shows Reversing valve in cool
- 8 - On shows unit in 'Test' mode

Figure 10- Unit Display/Interface



MUI Menu Navigation for RWXW Reversible Chiller

Welcome

Info Temp Stat Outputs Settings Alarm ALM_History Password Maint

Info

WFI
Dual Stage
Reversible Chiller
PRODCWWE-06
MM/DD/YY

Temp

Temperatures	
Enter Load	77.2°F
Leave Load	51.0°F
Enter Source	70.0°F
Leave Source	66.0°F
Source Frz1	77.8°F
Source Frz2	30.0°F
Load Frz1	30.0°F
Load Frz2	30.0°F
Src Frz Setpt	30.0°F
LD Frz Setpt	30.0°F

Stat

Status	
Unit Status	Auto
Y1 Status	OFF
Y2 Status	OFF
B Status	OFF
Emerg Shutdown	OFF
Current Sens1	OFF
Current Sens2	OFF
Load Flow	OFF
Src Flow	OFF
Low Pres1	ON
Hi Pres1	OFF
Low Pres2	ON
Hi Pres2	ON
Comp1 Low Limit	NML
Comp2 Low Limit	NML

Outputs

Outputs	
Comp1 Status	ON
Comp2 Status	OFF
Lead	Comp1
Acc1 Status	OFF
Stg1 Status	Normal
Stg2 Status	Normal
BO7	OFF
BO8	OFF
BO9	OFF
EXPB01	OFF
EXPB02	OFF
EXPB07	OFF
EXPB08	OFF

Settings

Settings	
Unit of Measure	F

Unit Display and Interface cont.

MUI Menu Navigation for RWXW Reversible Chiller cont.

Password

Password
Log-In
User: maint
Code: 5667

Maint

LOG_IN REQUIRED
Must login through the "Password" Menu before Maint menu will appear.

Alarm

ALARM SUMMARY
^/High Pressure

Maintenance	
Y1 Input	Auto
Y2 Input	Auto
B Input	Auto
Emerg SD	Auto
Acc1 Sel	ON Comp
Lead/Lag Select	OFF
Lead/Lag Time	24 hr
Low Frz Setpt	15°F
Hi Frz Setpt	33°F
Acc1 Dly	9 S

Alm-History

Alarm	#Events
Load Flow	0
Lo Press1	0
Src Freeze1	0
Ld Freeze1	0
Src Flow	0
Hi Press1	0
Src FP1 Bad	0
Ld FP1 Bad	0
Lo Press2	0
Src Freeze2	0
Src FP2 Bad	0
Ld Freeze2	0
Ld FP2 Bad	0
Hi Press2	0

Press right arrow key one time from Alm_History Menu

Alarm	#Events
Cmp1 StrtFail	0
Cmp2 StrtFail	0
LossOfChrg1	0
LossOfChrg2	0

NOTE: This FX10 application implements an **alarm history** which is reset only by cycling power. This history shows on the Alm-History page. Any alarm showing 2+ events has occurred more than 2 times.

Alarm lock-outs are reset by cycling power, by pressing the "ESC" and Return ↵ keys simultaneously for a minimum of 15 seconds, or by commanding the nviAlarmReset over the BAS network.

Test mode is enabled by holding the 'Esc' and Down Arrow simultaneously for a minimum of 15 seconds and releasing. Test mode times out after 30 minutes, and may also be ended by pressing 'ESC' and Up Arrow simultaneously and releasing. Test Mode bypasses the On Delay (90 sec) and Random Start timers for quicker troubleshooting. It also allows cycling the reversing valve without compressor shutdown.

Unit Display and Interface cont.

Menu and Menu Contents

Alarm

- Displays unit alarms until the unit has been reset (Unit alarms can be reset by holding both the Escape (ESC) key and Return (←) key for five seconds or by power cycling the unit.)

Alarm History

If a fault occurs the fault will be recorded in history viewable on the unit mounted display. Each fault type will be displayed in the history menu with a number between 0 and 3. A reading of 3+ means that the fault has occurred more than 3 times in the past. The history menu can be cleared with a power cycle only. Alarm date and time are not included in the history.

Unit Alarms

Unit alarms are shown on the display once the unit has locked out.

Load Flow – Load flow switch is not closed

- The load flow switch must be closed prior to either compressor starting and must remain closed for the entire run time of the compressor(s).

Low Pressure 1 – Compressor Circuit 1 Low Pressure switch

- The low pressure switch is checked before compressor start up and is monitored during compressor operation.

Src FP 1 Temp Low – Source Freeze Detection Sensor 1

- The source freeze detection sensor on compressor circuit 1 has reached its setpoint.

Src FP 1 Sensor Bad

- The sensor for Source freeze detection on compressor circuit 1 is unreliable or is not reading.

LD FP 1 Temp Low – Load Freeze Detection Sensor 1

- The load freeze detection sensor on compressor circuit 1 has reached its setpoint.

LD FP 1 Sensor Bad

- The sensor for Load freeze detection on compressor circuit 1 is unreliable or is not reading.

Source Flow – Source Flow switch is not closed

- The source flow switch must be closed prior to either compressor starting and must remain closed for the entire run-time of the compressor(s).

High Pressure 1 – Compressor Circuit 1 High Pressure Switch

- If high pressure switch 1 opens at any time during compressor 1 run time the compressor will be shut down immediately.

Low Pressure 2 - Compressor Circuit 2 Low Pressure Switch

- The low pressure switch is checked before compressor start up and is monitored during compressor operation.

Src FP 2 Temp Low - Source Freeze Detection Sensor 2

- The source freeze detection sensor on compressor circuit 2 has reached its setpoint.

Src FP 2 Sensor Bad

- The sensor for Source freeze detection on compressor circuit 2 is unreliable or is not reading.

LD FP 2 Temp Low - Load Freeze Detection Sensor 2

- The load freeze detection sensor on compressor circuit 2 has reached its setpoint.

LD FP 2 Sensor Bad

- The sensor for Load freeze detection on compressor circuit 2 is unreliable or is not reading.

High Pressure 2 - Compressor Circuit 2 High Pressure Switch

- If high pressure switch 2 opens at any time during compressor 2 run time the compressor will be shut down immediately.

Comp Start Failure – Compressor Start Failure

- If either compressor fails to start when the contactor pulls in the compressor current switch will cause that compressor to be locked out after 2 retries. The other compressor will continue to operate normally in this condition.

Reference Calculations

Heating Calculations:	Cooling Calculations:
$LWT = EWT - \frac{HE}{GPM \times 500^*}$	$LWT = EWT + \frac{HR}{GPM \times 500^*}$

NOTE: * When using water. Use 485 for 15% methanol/water or Environol solution.

Legend

Abbreviations and Definitions

ELT = entering load fluid temperature to heat pump
LLT = leaving load fluid temperature from heat pump
LGPM = load flow in gallons per minute
LWPD = load heat exchanger water pressure drop
EST = entering source fluid temperature to heat pump
LST = leaving source fluid temperature from heat pump
SGPM = source flow in gallons per minute
SWPD = source heat exchanger water pressure drop
EER = cooling energy effciency (TC/KW)
PSI = pressure drop in pounds per square inch
FT HD = pressure drop in feet of head
KW = kilowatt
HR = heat rejected in MBTUH
TC = total cooling capacity in MBTUH
COP = coefficient of performance (HC/KW x 3.413)
HC = heating capacity in MBTUH
HE = heat of extraction in MBTUH

Unit Startup

Verify the following:

- High voltage is correct and matches nameplate
- Fuses, breakers and wire size are correct
- Low voltage wiring is complete
- Piping is complete and the water system has been cleaned and flushed
- Air is purged from closed loop system
- Isolation valves are open and water control valves or loop pumps are wired
- Service/access panels are in place
- Transformer has been switched to lower voltage tap if needed (208/230 volt units only)
- Unit controls are in “off” position
- Flow switches are installed and ready or wires are jumpered
- Freeze detection setpoints have been set in the microprocessor

WARNING: Verify ALL water controls are open and allow water flow PRIOR to engaging the compressor. Failure to do so can result in freezing the heat exchanger or water lines causing permanent damage to the unit.

Startup Steps

- Set thermostat control above cooling setpoint.
- Set thermostat control in cooling mode.
- Slowly reduce the control setting until both the compressor and water control valve/loop pumps are activated. Verify that the compressor is on and that the water flow rate is correct by measuring pressure drop through the heat exchanger and comparing to the Pressure Drop table. Check for correct rotation of scroll compressors. Switch any two power leads at the L1, L2, and L3 line voltage termination block if incorrect.
- Perform a cooling capacity test by multiplying GPM x ΔT x 485 (antifreeze/water). Use 500 for 100% water. Check capacity against catalog data at same conditions.
- Set control to “OFF” position.
- Leave unit “OFF” for approximately five (5) minutes to allow pressure to equalize.
- Adjust control below heating setpoint.
- Set control in “HEAT” position mode.
- Slowly increase the control setting until both compressor and water control valve/loop pumps are activated. The reversing valve should be heard changing over.
- Perform a heating capacity test by multiplying GPM x ΔT x 485 (antifreeze/water). Use 500 for 100% water. Check capacity against catalog data at same conditions.
- Check for vibrations, noise and water leaks.
- Set system to maintain desired setpoint.
- Instruct the owner/operator of correct control and system operation.

Operating Parameters

Heating Mode

Entering Load Temp (°F)	Entering Source Temp (°F)	Suction Pressure (psig)	Discharge Pressure (psig)	Superheat (°F)	Subcooling (°F)
60	30	75-100	200-215	10-12	10-13
	50	100-125	200-215	12-14	8-12
	70	125-150	215-230	14-18	8-12
	90	150-165	230-255	25-30	8-12
80	30	75-100	285-300	10-12	10-13
	50	100-125	300-315	12-14	8-12
	70	125-150	315-330	14-18	8-12
	90	150-165	330-345	25-30	8-12
100	30	85-110	365-380	10-12	7-11
	50	110-135	385-400	12-14	7-11
	70	135-165	400-415	14-18	3-7
120	50	110-135	485-500	12-14	7-11
	70	135-165	500-515	14-18	3-7

NOTE: Operating data based on normal conditions with 3 gpm/ton for the load and source.

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Cooling Mode

Entering Load Temp (°F)	Entering Source Temp (°F)	Suction Pressure (psig)	Discharge Pressure (psig)	Superheat (°F)	Subcooling (°F)
50	30	80-90	140-175	15-20	3-6
	50	90-100	200-235	11-15	6-9
	70	100-110	250-285	11-15	9-12
	90	100-120	330-365	8-12	12-14
	110	110-130	430-465	8-12	14-19
70	30	80-90	150-185	15-20	3-6
	50	90-100	210-245	11-15	6-9
	70	100-110	260-295	11-15	9-12
	90	110-120	340-375	8-12	12-14
	110	110-140	440-485	8-12	14-19
90	30	80-90	150-185	15-20	3-6
	50	90-100	210-245	11-15	6-9
	70	100-110	260-295	11-15	9-12
	90	110-120	340-375	8-12	12-14
110	30	90-100	160-195	40-45	3-6
	50	110-130	220-255	30-40	6-9

NOTE: Operating data based on normal conditions with 3 gpm/ton for the load and source.

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Compressor Resistance

Model	208-230	460	575
096	0.610	2.330	4.060
108	0.610	2.330	4.060
120	0.562	2.270	3.560
140	0.422	2.200	3.289
180	0.320	1.298	1.999
210	0.320	1.298	1.999
240	0.330	1.110	1.710
360	0.226	0.833	1.268
540	n/a	0.450	0.701

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Pressure Drop

Model	GPM	Pressure Drop (psi)				
		30°F	50°F	70°F	90°F	110°F
096	12	0.8	0.6	0.4	0.2	0.1
	18	1.7	1.5	1.3	1.0	0.8
	24	2.7	2.4	2.2	1.9	1.5
	30	3.8	3.6	3.3	3.1	2.4
108	14	1.1	0.9	0.7	0.5	0.3
	21	2.2	2.0	1.8	1.5	1.2
	28	3.4	3.2	2.9	2.7	2.1
	36	4.9	4.7	4.4	4.2	3.3
120	15	1.0	0.8	0.5	0.3	0.1
	23	2.5	2.3	2.0	1.8	1.3
	30	3.8	3.6	3.3	3.1	2.4
	40	5.6	5.4	5.1	4.9	3.9
140	18	0.7	0.4	0.3	0.1	0.1
	27	1.5	1.3	1.2	1.0	0.9
	36	3.1	2.8	2.5	2.2	1.9
	48	5.2	4.8	4.2	3.8	3.3
180	23	1.1	0.9	0.8	0.6	0.5
	34	2.7	2.5	2.2	1.9	1.7
	45	4.7	4.3	3.8	3.4	3.0
	60	7.4	6.8	6.0	5.4	4.7
210	26	0.7	0.5	0.3	0.2	0.1
	39	1.4	1.1	0.9	0.7	0.5
	52	2.5	2.2	1.9	1.6	1.3
	72	5.2	4.7	4.2	3.7	3.2
240	30	0.9	0.6	0.4	0.2	0.1
	45	2.2	1.9	1.6	1.3	1.0
	60	4.3	3.8	3.4	3.0	2.5
	80	6.5	5.8	5.3	4.7	4.1
360	45	1.5	1.3	1.2	1.1	1.0
	68	3.6	3.4	3.2	3.0	2.8
	90	4.4	4.1	3.8	3.5	3.3
	120	5.8	5.5	5.2	4.9	4.6
540	68	1.4	1.2	1.0	0.8	0.7
	108	3.4	3.2	3.0	2.7	2.5
	135	5.0	4.8	4.5	4.2	3.9
	180	7.7	7.5	7.0	6.7	6.2

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Heat of Extraction/Rejection Data

Model	Source GPM	Load GPM	EST	Heat Of Extraction (HE)				Heat of Rejection (HR)			
			ºF	60°F	80°F	100°F	120°F	50°F	70°F	90°F	110°F
096	24	24	30	83.6	75.4	67.3	na	127.2	143.1	159.0	174.9
			50	105.1	96.9	88.7	80.4	121.8	138.6	155.5	172.3
			70	126.7	118.3	110.0	101.7	116.3	134.1	151.9	na
			90	148.2	139.8	131.4	na	110.8	129.6	148.4	na
			110	not available				105.4	125.1	na	na
108	28	28	30	90.9	81.9	72.8	na	159.8	184.3	208.8	233.3
			50	115.2	105.3	95.3	85.4	154.9	179.2	203.5	227.8
			70	139.6	128.7	117.8	106.9	150.0	174.1	198.2	na
			90	164.0	152.1	140.3	na	145.1	169.0	192.9	na
			110	not available				140.1	163.9	na	na
120	30	30	30	96.0	82.7	69.4	na	180.2	219.7	259.1	298.6
			50	134.4	119.3	104.2	89.1	172.5	211.3	250.2	289.0
			70	172.8	155.9	139.0	122.1	164.9	203.0	241.2	na
			90	211.2	192.5	173.8	na	157.2	194.7	232.3	na
			110	not available				149.5	186.4	na	na
140	36	36	30	112.4	96.5	80.6	na	195.9	239.9	283.8	327.8
			50	148.7	131.6	114.5	97.3	188.6	232.1	275.6	319.1
			70	214.7	206.2	197.8	189.3	181.2	224.2	267.3	na
			90	221.3	201.7	182.1	na	173.8	216.4	259.1	na
			110	not available				166.4	208.6	na	na
180	45	45	30	136.0	116.3	96.6	na	226.0	279.5	333.1	386.6
			50	172.8	152.0	131.3	110.5	216.7	270.8	324.9	379.0
			70	209.6	187.8	166.0	144.1	207.5	262.1	316.8	na
			90	246.5	223.6	200.7	na	198.3	253.4	308.6	na
			110	not available				189.0	244.7	na	na
210	52	52	30	151.1	131.2	111.4	na	286.7	345.6	404.5	463.5
			50	207.1	183.9	160.7	137.5	274.0	333.8	393.5	453.3
			70	263.1	236.6	210.1	183.5	261.4	321.9	382.5	na
			90	319.1	289.3	259.4	na	248.7	310.1	371.5	na
			110	not available				236.1	298.3	na	na
240	60	60	30	170.7	147.0	123.3	na	310.0	373.5	437.0	500.6
			50	226.9	200.3	173.7	147.1	298.6	364.1	429.7	495.3
			70	283.1	253.6	224.1	194.6	287.1	354.8	422.4	na
			90	339.3	306.9	274.5	na	275.7	345.4	415.1	na
			110	not available				264.3	336.0	na	na
360	90	90	30	256.9	225.4	193.9	na	428.4	494.2	560.0	625.8
			50	340.7	305.0	269.4	233.8	422.1	487.8	553.5	619.2
			70	424.5	384.7	344.9	305.1	415.8	481.4	546.9	na
			90	508.3	464.0	420.4	na	409.5	474.9	540.4	na
			110	not available				403.1	468.5	na	na
540	135	135	30	410.7	362.7	314.7	na	721.0	882.9	1044.7	1206.6
			50	523.2	471.8	420.3	368.8	691.0	850.7	1010.5	1170.2
			70	635.8	580.8	525.9	470.9	661.0	818.6	976.3	na
			90	748.4	689.9	631.5	na	630.9	786.5	942.0	na
			110	not available				600.9	754.4	na	na

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Troubleshooting

Should a major problem develop, refer to the following information for possible causes and corrective steps.

If compressor won't run:

1. The fuse may be open or the circuit breaker is tripped. Check electrical circuits and motor windings for shorts or grounds. Investigate for possible overloading. Replace fuse or reset circuit breakers after fault is corrected.
2. Supply voltage may be too low. Check it with a volt meter.
3. Control system may be faulty. Check control for correct wiring of thermostat or aquastat and check the 24 volt transformer for proper voltage.
4. Wires may be loose or broken. Replace or tighten.
5. The low pressure switch may have tripped due to one or more of the following:
    a) Heating
        1) Plugged heat exchanger on source side
        2) Water flow source side -(Low)
        3) Water too cold source side
        4) Low refrigerant
    b) Cooling
        1) Plugged heat exchanger on load side
        2) Water flow load side - (Low)
        3) Water too cold load side
        4) Low refrigerant
6. The high pressure switch may have tripped due to one or more of the following:
    a) Heating
        1) Plugged heat exchanger on load side
        2) Low water flow load side
        3) Water too warm load side
    b) Cooling
        1) Plugged heat exchanger on source side
        2) Low water flow on source side
        3) Water too warm source side
7. The compressor overload protection may be open. Disconnect power. Remove S1 & S2 wires from the compressor protection module. Measure the resistance between the S1 & S2 wires. If the resistance measures > 2750 ohms, then the internal compressor resistance has tripped the compressor protection module. The compressor protection module will reset after a 30 minute delay and the resistance measures < 2250 ohms. Cycling the power off for a minimum of 3 seconds will manually reset the compressor module. The internal compressor resistance must measure < 2250 ohms for the compressor module to reset.
8. The internal winding of the compressor motor may be grounded to the compressor shell. If so, replace the compressor.
9. The compressor winding may be open or shorted. Disconnect power. Check continuity with ohm meter. If the winding is open, replace the compressor.

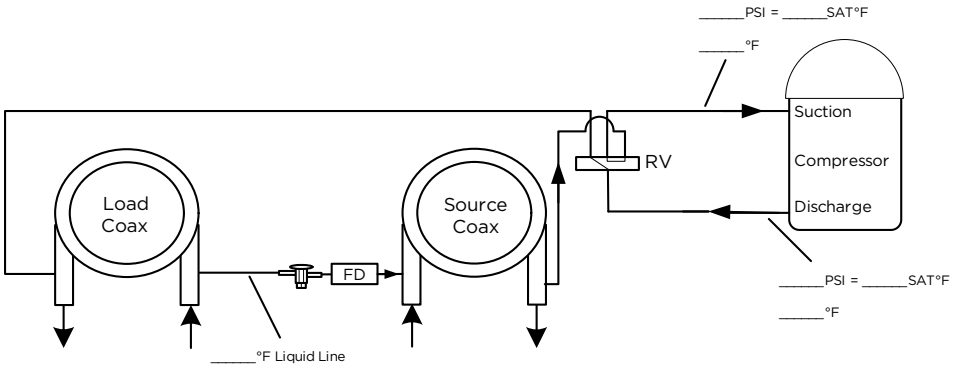
If sufficient cooling or heating is not obtained:

1. Check control for improper location or setting.
2. Check for restriction in water flow.
3. Check refrigerant subcooling and superheat for proper refrigerant charge and expansion valve operation.
4. The reversing valve may be defective and creating a bypass of refrigerant. If the unit will not heat, check the reversing valve coil.

If the unit operation is noisy:

1. Check compressor for loosened mounting bolts. Make sure compressor is floating free on its isolator mounts. Check for tubing contact with the compressor or other surfaces. Readjust it by bending slightly.
2. Check screws on all panels.
3. Check for chattering or humming in the contactor or relays due to low voltage or a defective holding coil. Replace the component.
4. Check for proper installation of vibration absorbing material under the unit.
5. Check for abnormally high discharge pressures.
6. Compressor rotation incorrect

Heating Cycle Analysis

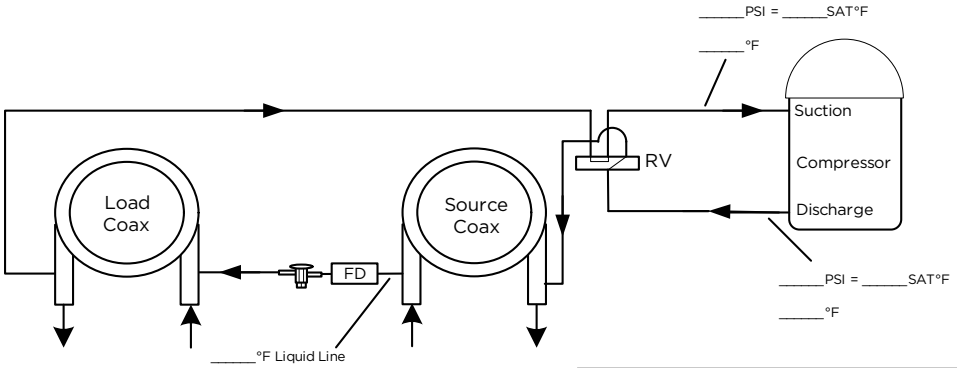


Unit Amp Draw	
Line Voltage	
Loop:	Open Closed
Subcooling	
Superheat	

Entering Source Water	°F
Entering Water Pressure	PSI
Leaving Source Water	°F
Leaving Water Pressure	PSI
Entering Load Water	°F
Entering Load Water Pressure	PSI
Leaving Load Water	°F
Leaving Load Water Pressure	PSI

NOTE: Do not attach refrigerant gauges unless a problem is suspected!

Cooling Cycle Analysis



Unit Amp Draw	
Line Voltage	
Loop:	Open Closed
Subcooling	
Superheat	

Entering Source Water	°F
Entering Water Pressure	PSI
Leaving Source Water	°F
Leaving Water Pressure	PSI
Entering Load Water	°F
Entering Load Water Pressure	PSI
Leaving Load Water	°F
Leaving Load Water Pressure	PSI

NOTE: Do not attach refrigerant gauges unless a problem is suspected!

RWXW Startup and Troubleshooting Form

Company Name: _____ Company Phone No: _____
Technician Name: _____ Date: _____
Model No: _____ Serial No: _____
Owner's Name: _____ Open or Closed Loop: _____
Installation Address: _____ Installation Date: _____

Check One
❑ Start up/Check-out for new installation ❑ Troubleshooting Problem: _____

1. FLOW RATE IN GPM (SOURCE SIDE HEAT EXCHANGER)

Water In Pressure:	a._____	PSI
Water Out Pressure:	b._____	PSI
Pressure Drop = a - b	c._____	PSI
Convert Pressure Drop to Flow Rate (refer to *Pressure Drop* table)	d._____	GPM

2. TEMPERATURE RISE OR DROP ACROSS SOURCE SIDE HEAT EXCHANGER

	COOLING		HEATING	
Water In Temperature:	e._____	°F	e._____	°F
Water Out Temperature:	f. _____	°F	f. _____	°F
Temperature Difference:	g._____	°F	g._____	°F

3. TEMPERATURE RISE OR DROP ACROSS LOAD SIDE HEAT EXCHANGER

	COOLING		HEATING	
Water In Temperature:	h._____	°F	h._____	°F
Water Out Temperature:	i. _____	°F	i. _____	°F
Temperature Difference:	j. _____	°F	j. _____	°F

4. HEAT OF REJECTION (HR) / HEAT OF EXTRACTION (HE) CALCULATION

HR or HE = Flow Rate x Temperature Difference x Brine Factor*
d. (above) x g. (above) x 485 for Methanol or Environol, 500 for water*
Heat of Extraction (Heating Mode) = _____ btu/hr
Heat of Rejection (Cooling Mode) = _____ btu/hr
Compare results to Capacity Data Tables

Note: Steps 5 through 8 need only be completed if a problem is suspected

5. WATTS

	COOLING		HEATING		HYDRONIC	
Volts:	m._____	VOLTS	m._____	VOLTS	m. _____	VOLTS
Total Amps (Comp. + Fan):	n. _____	AMPS	n. _____	AMPS	n. _____	AMPS
Watts = m. x n. x 0.85	o. _____	WATTS	o. _____	WATTS	o. _____	WATTS

6. CAPACITY

Cooling Capacity = HR. - (o. x 3.413)	p. _____	btu/hr
Heating Capacity= HE. + (o. x 3.413)	p. _____	btu/hr

7. EFFICIENCY

Cooling EER = p. / o.	q. _____	EER
Heating COP = p. / (o. x 3.413)	q. _____	COP

8. SUPERHEAT (S.H.) / SUBCOOLING (S.C.)

COOLING			HEATING		HYDRONIC	
Suction Pressure:	r. _____	PSI	r. _____	PSI	r. _____	PSI
Suction Saturation Temperature:	s. _____	°F	s. _____	°F	s. _____	°F
Suction Line Temperature:	t. _____	°F	t. _____	°F	t. _____	°F
Superheat = t. - s.	u. _____	°F	u. _____	°F	u. _____	°F
Head Pressure:	v. _____	PSI	v. _____	PSI	v. _____	PSI
High Pressure Saturation Temp.:	w. _____	°F	w. _____	°F	w. _____	°F
Liquid Line Temperature*:	x. _____	°F	x. _____	°F	x. _____	°F
Subcooling = w. - x.	y. _____	°F	y. _____	°F	y. _____	°F

* Note: Liquid line is between the source heat exchanger and the expansion valve in the cooling mode; between the load heat exchanger and the expansion valve in the heating mode.

Preventive Maintenance

Unit Heat Exchanger Maintenance

1. Keep all air out of the water or antifreeze solution.
2. Keep the system under pressure at all times. Closed loop systems must have positive static pressure or air vents may draw air into the system.

NOTES: If the installation is in an area with a known high mineral content in the water, it is best to establish with the owner a periodic maintenance schedule for checking the water-to-refrigerant heat exchanger on a regular basis. Should periodic cleaning be necessary, use standard cleaning procedures. Generally, the more water flowing through the unit, the less chance there is for scaling. Low GPM flow rates produce higher temperatures through the heat exchanger. To avoid excessive pressure drop and the possibility of metal erosion, do not exceed GPM flow rate as shown on the specification sheets for each unit.

Replacement Procedures

When contacting the company for service or replacement parts, refer to the model number and serial number of the unit as stamped on the serial plate attached to the unit. If replacement parts are required, mention the date of installation of the unit and the date of failure, along with an explanation of the malfunctions and a description of the replacement parts required.

In-Warranty Material Return

Material may not be returned except by permission of authorized warranty personnel. Contact your local distributor for warranty return authorization and assistance.

Service Parts List

Part Description		096			108			120		
		208-230/60/3	460/60/3	575/60/3	208-230/60/3	460/60/3	575/60/3	208-230/60/3	460/60/3	575/60/3
Refrigeration Components	Compressor	34P613-03	34P613-04	34P613-05	34P616-03	34P616-04	34P616-05	34P569-03	34P569-04	34P569-05
	Compressor Sound Jacket	92P519-02			92P519-02			92P504A03		
	Thermal Expansion Valve	33P608-18			33P608-10			33P608-16		
	TXV's per circuit	1			1			1		
	Filter Dryer	36P500B02			36P500B02			36P500B02		
	Reversing Valve with Coil	33P526-04			33P526-04			33P526-04		
	Brazed Plate Heat Exchanger	62P562-01			62P562-01			62P562-01		
	Heat Exchanger Support Bracket	47C775-03			47C775-03			47C775-03		
Safeties / Sensors	High Pressure Switch	35P506B02			35P506B02			35P506B02		
	Low Pressure Switch	35P506B01			35P506B01			35P506B01		
	Water Temperature Sensor	12P529-01			12P529-01			12P529-01		
	Freeze Detection Sensor	12P529-01			12P529-01			12P529-01		
Electrical	Compressor Contactor	13P537B03			13P537B03			13P537B03		
	Transformer	15P501B01	15P505B01	15P506B01	15P501B01	15P505B01	15P506B01	15P501B01	15P505B01	15P506B01
	Power In Terminal Block	12P524A01			12P524A01			12P524A01		
	Connection Block - Small	12P503-06			12P503-06			12P503-06		
	Connection Block - Low Voltage	12P520-01			12P520-01			12P520-01		
	Grounding Lug	12P004A			12P004A			12P004A		
	Phase Guard Monitor	19P541A05		19P541A04	19P541A05		19P541A04	19P541A05		19P541A04
Control	FX10 Main Board - no communications	17X51606-09			17X51606-09			17X51606-09		
	FX10 Main Board & N2 Open Com Card	17X51606-10			17X51606-10			17X51606-10		
	FX10 Main Board & Lonworks Com Card	17X51606-12			17X51606-12			17X51606-12		
	FX10 Main Board & BACnet Com Card	17X51606-11			17X51606-11			17X51606-11		
	FX10 Expansion Board	17P516-07			17P516-07			17P516-07		
	Display	19P563-01			19P563-01			19P563-01		
	FX10 Display Interface Board	17P516-11			17P516-11			17P516-11		
Enclosure	Side Access Panel	40C792-10			40C792-10			40C792-10		
	Front Upper Access Panel	40C792-08			40C792-08			40C792-08		
	Lower Front Access Panel	40C792-09			40C792-09			40C792-09		
	Top Panel	40C792-05			40C792-05			40C792-05		
	Rear Left Panel	40C792-07			40C792-07			40C792-07		
	Rear Right Panel	40C792-06			40C792-06			40C792-06		

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Service Parts List cont.

Part Description		140			180			210		
		208-230/60/3	460/60/3	575/60/3	208-230/60/3	460/60/3	575/60/3	208-230/60/3	460/60/3	575/60/3
Refrigeration Components	Compressor	34P614-03	34P614-04	34P614-05	34P617-03	34P617-04	34P617-05	34P618-03	34P618-04	34P618-05
	Compressor Sound Jacket	92P519-02			92P519-03			92P519-03		
	Thermal Expansion Valve	33P608-16			33P605-14			33P572-02		
	TXV's per circuit	1			1			1		
	Filter Dryer	36P500B02			36P500B04			36P500B04		
	Reversing Valve with Coil	33P526-04			33P077-05			33P077-05		
	Brazed Plate Heat Exchanger	62P563-01			62P563-01			62P564-01		
	Heat Exchanger Support Bracket	47C775-03			47C775-03			47C775-03		
Safeties / Sensors	High Pressure Switch	35P506B02			35P506B02			35P506B02		
	Low Pressure Switch	35P506B01			35P506B01			35P506B01		
	Water Temperature Sensor	12P529-01			12P529-01			12P529-01		
	Freeze Detection Sensor	12P529-01			12P529-01			12P529-01		
Electrical	Compressor Contactor	13P537B04	13P537B03		13P537B04	13P537B03		13P537B04	13P537B03	
	Transformer	15P501B01	15P505B01	15P506B01	15P501B01	15P505B01	15P506B01	15P501B01	15P505B01	15P506B01
	Power In Terminal Block	12P524A01			12P524A01			12P524A01		
	Connection Block - Small	12P503-06			12P503-06			12P503-06		
	Connection Block - Low Voltage	12P520-01			12P520-01			12P520-01		
	Grounding Lug	12P004A			12P004A			12P004A		
	Phase Guard Monitor	19P541A05		19P541A04	19P541A05		19P541A04	19P541A05		19P541A04
Control	FX10 Main Board - no communications	17X51606-09			17X51606-09			17X51606-09		
	FX10 Main Board & N2 Open Com Card	17X51606-10			17X51606-10			17X51606-10		
	FX10 Main Board & Lonworks Com Card	17X51606-12			17X51606-12			17X51606-12		
	FX10 Main Board & BACnet Com Card	17X51606-11			17X51606-11			17X51606-11		
	FX10 Expansion Board	17P516-07			17P516-07			17P516-07		
	Display	19P563-01			19P563-01			19P563-01		
	FX10 Display Interface Board	17P516-11			17P516-11			17P516-11		
Enclosure	Side Access Panel	40C792-10			40C792-10			40C792-10		
	Front Upper Access Panel	40C792-08			40C792-08			40C792-08		
	Lower Front Access Panel	40C792-09			40C792-09			40C792-09		
	Top Panel	40C792-05			40C792-05			40C792-05		
	Rear Left Panel	40C792-07			40C792-07			40C792-07		
	Rear Right Panel	40C792-06			40C792-06			40C792-06		

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Service Parts List cont.

Part Description		240			360			540	
		208-230/60/3	460/60/3	575/60/3	208-230/60/3	460/60/3	575/60/3	460/60/3	575/60/3
Refrigeration Components	Compressor	34P619-03	34P619-04	34P619-05	34P606-03	34P606-04	34P606-05	34P610-04	34P610-05
	Compressor Sound Jacket	92P519-03			92P518-01			92P517-01	
	Thermal Expansion Valve	33P572-02			33P572-01			33P572-01	
	TXV's per circuit	1			1			2	
	Filter Dryer	36P500B04			36P500B06			36D500B06	
	Reversing Valve with Coil	33P077-05			33P546-04			33P607-01	
	Brazed Plate Heat Exchanger	62P564-01			62P550-02			62P551-01	
	Heat Exchanger Support Bracket	47C775-03			47C698-01			47C713-01	
Safeties / Sensors	High Pressure Switch	35P506B02			35P506B02			35P506B02	
	Low Pressure Switch	35P506B01			35P506B01			35P506B01	
	Water Temperature Sensor	12P529-01			12P529-01			12P529-01	
	Freeze Detection Sensor	12P529-01			12P529-01			12P529-01	
Electrical	Compressor Contactor	13P537B05	13P537B03		13P537B05	13P537B04		13P537B05	13P537B05
	Transformer	15P501B01	15P505B01	15P506B01	15P501B01	15P505B01	15P506B01	15P505B01	15P506B01
	Power In Terminal Block	12P524A01			12P524A01			12P524A01	
	Connection Block - Small	12P503-06			12P503-06			12P503-06	
	Connection Block - Low Voltage	12P520-01			12P520-01			12P520-01	
	Grounding Lug	12P004A			12P004A			12P004A	
	Phase Guard Monitor	19P541A05		19P541A04	19P541A05		19P541A04	19P541A05	19P541A04
Control	FX10 Main Board - no communications	17X51606-09			17X51606-09			17X51606-09	
	FX10 Main Board & N2 Open Com Card	17X51606-10			17X51606-10			17X51606-10	
	FX10 Main Board & Lonworks Com Card	17X51606-12			17X51606-12			17X51606-12	
	FX10 Main Board & BACnet Com Card	17X51606-11			17X51606-11			17X51606-11	
	FX10 Expansion Board	17P516-07			17P516-07			17P516-07	
	Display	19P563-01			19P563-01			19P563-01	
	FX10 Display Interface Board	17P516-11			17P516-11			17P516-11	
Enclosure	Side Access Panel	40C792-10			40C752-01			40C758-01	
	Front Upper Access Panel	40C792-08			40C750-01			40C757-01	
	Lower Front Access Panel	40C792-09			40C751-01			40C756-01	
	Top Panel	40C792-05			42C356-01			42C357-01	
	Rear Left Panel	40C792-07			40C754-01			40C760.01	
	Rear Right Panel	40C792-06			40C753-01			40C759-01	

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Product:	**RW Series**
Type:	Commercial Reversible Chiller - 60 Hz
Size:	8-50 Tons
Document Type:	Installation Manual
Part Number:	146.00-NOM6
Release Date:	02/10